RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK
BRANCH OFFICES AT 375 OLD COLONY BUILDING, CHICAGO, AND QUEEN ANNE'S CHAMBERS WESTMINSTER LONDON

EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XL., No. 22. FRIDAY, JUNE 1, 1906.

The disk signal, enclosed in a case, can compete with the three-position semaphore, if it chooses to, as well as with the two-position. With a large rectangular case the right, left and upper sides can be utilized for three openings, or the three colors can be shown at a single opening, one color at a time. (At night the semaphore has no advantage over the disk in any respect.) We state these elementary truths, though the question is somewhat academic, because our correspondent, "N. E. P.," whose letter we print, seems to think that to support and defend the enclosed disk he must vanquish the three-position and the upward inclination. The semaphore is beautifully adapted to the three-position principle; but a combination of three dots on a large solid-color background also makes an effective image. Poker players seem to be well satisfied with the dot idea. The notion that we must stick to the semaphore because we must insure a far-away view is gradually being demolished by the increased use of distant signals, as our correspondent well says, and by the growing necessity, in cities and on crowded lines, of getting along without far-away views. The final argument for the three-position semaphore is based on economy, for the argument that it simplifies the duty of the engineman is not universally accepted. It is claimed in behalf of some enginemen that the simple, compound or composite idea that must be formed in the mind on coming in sight of an automatic block signal is formed more easily when there are two arms to convey the desired information, as in the automatics east of Pittsburg, than when there is only one arm, as in the signals west of Pittsburg. Economy being the issue, the enclosed disk asks no odds of any signal which has moving parts exposed to wind, snow and frost.

The other points presented by "N. E. P." are as sound as this one—and perhaps as seriously in need of friends! He need not fear that the semaphore will be made more popular by the change to the upper quadrant, for its popularity is about as general as could be imagined already. Now is a good time, however, to open the question of the merits of the semaphore, on any ground, for the spirit of inquiry seems to be in the air. The discussion at the last meeting of the Railway Signal Association, with its suggestions of putting arms on the left of the post, and of having arms pivoted in the middle, showed that the upward inclination is not the only change that is being seriously thought about. Relief from high posts seems likely to come, after a time, from the same causes as the relief from the distant-view idea. The necessity of keeping clear of overhead structures, as in the New York Subway and on other roads in cities, will gradually compel the use of lower signals. On the fundamental issue of cheapness—and in this case simplicity goes with cheapness—N. E. P. must reinforce the argument by the records of successive years. The signal engineer or the manager who is wedded to the semaphore is not likely to look upon it as an extravagant consumer of money until he sees overwhelming evidence of the cheapness of the simpler signal. To overwhelm him is likely to take time. The disk-ussion will have to be supported by figures as well as by rhetoric. In the matter of "normal-danger" the interesting point is that we are hearing from an advocate who speaks from intimate and intelligent experience; for questions of this sort have been settled in far too many cases by theory and persuasion, without due consideration of the results of actual use. But as for passing an opinion in this place, with a view to scientifically settling the question—why, what would the rival signal companies do for fuel to feed the fires of their far-fetched controversies?

Repeated and somewhat insistent reports come from Boston of a project for a new electric long-distance line between that city and Providence paralleling the old Boston & Providence steam line leased to the Old Colony, and now a part of the New Haven system. This opens out and delineates an interesting stage of President Mellen's rapid and picturesque campaign of acquiring electric railways. To continue the strategic metaphor, the New Haven, as a territorial whole, has seven important points for protective outworks. They are New York, Pittsfield, Springfield, Worcester, Boston, Fall River and Providence. Assuming the correctness of the asserted purchase of the Worcester street railway system by the New Haven the first four points named—New York, Pittsfield, Springfield and Worcester—are now practically intrenched against parallel railway attack, as is the whole of Connecticut, except at the cities—Bridgeport, Norwalk, Derby, Ansonia, Waterbury and New Britain—reached directly by the Connecticut Railway & Lighting Corporation. Westward and centrally, President Mellen, with

more than 700 miles of street railway, thus holds the fort. But eastward the case is different, and his system is still vulnerable in the large and intricate network of steam roads of the Old Colony group lying southward of Boston and north of Providence and Fall River. The key of the position is Providence and the suggested protective step, the buying up of the street railway system there, which means the purchase of the whole street railway system of Rhode Island, which has been twice recapitalized with very liberal injections of water. It will be a bold venture, even for President Mellen in the ardor of success of his expansive electric policy so far as it has gone, which last year was financially more than self-supporting, and which this year will probably show a net balance of not less than 2½ per cent. on the stock of his great holding company, the Consolidated Railway Corporation. In connection with the possible purchase of the Rhode Island street railways is not to be overlooked that amazing piece of legislation some years ago, by which certain limits of taxation were worked into the form of a permanent contract with the state—a contract which may yet have to be tried out in the United States Supreme Court. The greater subject of immediate interest, however, is the shifting to the eastward of President Mellen's electric "fortification" policy, and the directions, tactics and strategy of his next Napoleonic campaign.

THE JUNGLE.

The reader of Upton Sinclair's "The Jungle," the book which was the direct cause of the Beveridge bill, providing for the rigid inspection of packing house products, finds much that causes him to reflect on the literature and on the fact which the present-day public is receiving. The reviewer who has made some personal study of Packingtown and its conditions, sees in this book a succession of caricatures—actual scenes and incidents of the meat industry so twisted and distorted that they make a picture which is indeed horrible, and would be yet more horrible if it were true. The picture is not true, and yet it has, as its basis, enough stern fact so that it would be very hard to disprove as a whole. There are unwholesome conditions, bad facts, to be found in every walk of life and in every modern industry. If a historian with a poor digestion and a bad temper should care to take as his hero an uneducated foreigner from an unenlightened part of Europe, and should so arrange it that he was ensnared by all the possible ills and evils that had been the collective experience of a thousand immigrants for ten years, his hero would be pretty sure to have a hard time of it, whether he engaged in the packing business, whether he worked in a cotton mill, or a ship yard, or a gun factory, or whether he simply became a farmer on the western plains, got into debt and always had his crops destroyed by the elements. In other words, Mr. Sinclair, considering the packing business bad for the workmen engaged therein, takes his hero and puts him successively through every kind of badness that he has been able to ferret out, using extreme examples of each, liberally seasoned with imagination. Even if the reader has never been to Chicago, Kansas City or Omaha, and does not know a packing house from a grain elevator, he can check up a good part of what may be called the non-technical experiences of Mr. Sinclair's unhappy hero from his own information. He knows, for example, that there are a good many days between Thanksgiving and the first of March when the temperature in Chicago does not go below zero; yet the Chicago winter pictured by this lurid writer is one succession of blizzards and of cold so intense that it is practically unlivable. This is only one instance of almost countless examples in the book where Mr. Sinclair has used the exceptional worst for the ordinary occurrence.

The book is more crudely written than any other notable piece of muck raking which we have seen. The author seems incapable of writing a narrative without resort to all the effects of the twenty-cent melodrama. Yet he has brought out one terrible truth amidst a most tremendous lot of foolishness, a truth exaggerated and distorted, but nevertheless most needful of remedy. His paragraphs relating to the way that condemned meat is doctored for use as food, convey a picture which is probably overdrawn, but they nevertheless describe a state of affairs which even in the least degree is insufferable, and the action taken to remedy this by Congress is as correct as it has been rapid.

But in his method of righting a wrong, the author of "The Jungle" has done much harm in his outspoken assumption that the fundamental methods of the packing business are horrible and inhuman. They are not. The industry has its peculiar limitations, requiring concentration of plants, great haste in the manufacture of perishable products, and a military form of discipline to govern an army of employees. The conditions of labor in Packingtown do not seem exceptionally severe and the rate of pay is good, as compared with that of other industries. One is scarcely disposed to deny that the ideal labor condition for the workingman of the humbler type is the small shop—the craft and the guild of three centuries ago. But civilization cannot be set back three centuries; we must just do the best that we can with the economics of modern life. It is highly important that the evils in the modern system should be eradicated, but it is also much to be desired that they should be eradicated by some other means than that of high-colored, overdrawn sensationalism. It is a reflection on the body politic that the condemned meat industry should have lived and flourished without check by the National or the Local Government, until exploited by the horror story of a journalist.

THE COAL CARRIERS.

Shall railroads control coal companies, shall coal companies control railroads, or shall joint control of both be lodged in the hands of outside capitalists? Since transportation is the biggest item affecting the conduct of the coal business, while coal is the biggest single item in a railroad's expense account, and also furnishes a very desirable branch of traffic, with an infinitely greater tonnage per acre of territory than that from any other natural source, it is most reasonable that railroads and coal companies should be correlated. The subject is now prominent in public attention. The Supreme Court in the Chesapeake & Ohio case held that a company acting in the joint capacity of a coal producer and a common carrier could not so manipulate its rates that a discrimination should result thereby. In April the Baltimore & Ohio sold its control of the Consolidation Coal Co., which was considered a most excellent purchase at the time it was made by Mr. Loree, and now Congress has under consideration, with strong likelihood of acceptance, the Elkins amendment providing that railroads engaging in interstate commerce may not own coal mines at all.

What is to be accomplished by the enactment of such legislation? Are discriminations to be prevented? The Supreme Court apparently found the existing law sufficient for this purpose. As a matter of general public policy it occurs to the layman that the effect of the passage of legislation similar to that proposed by Senator Elkins will be to place joint control of railroads and coal mines precisely where it will be least amenable to governmental control. That is to say, if the railroads are prevented from engaging in the coal business, coal owners, not subject to the Act to Regulate Commerce or the Hepburn Bill, will be most likely to engage in the railroad business. This need not be done—it doubtless will not be done—by any process as direct as the actual control of securities under a corporate title, but there are many ways by which mutuality of interest can be secured through the personal co-operation of individuals; mutuality of interest similar to that which causes the Chicago & North-Western to be classed as a Vanderbilt property. The areas of unmined coal in this country are very great, but they are not unlimited, and possession of them in railroad interest is so vital a thing that no president of a great railroad, facing strong competition, would be satisfied that a theoretical independence of these properties was true independence. When legislation sets itself against strong economic motives it fights an unequal battle. The Northern Securities Company was dissolved, but has there been any change in the co-operative attitude of the Great Northern, the Northern Pacific and the Chicago, Burlington & Quincy? Only this, that the real element of competition in the Securities Company, the Harriman interest, was driven into a minority by the prorating of securities approved by the courts, which substituted the single Hill control for joint control by Hill and Harriman. So far as the amalgamation of parallel and competing lines is concerned, they are still amalgamated, and they do not yet compete in the sense read into the Elkins Act by the Supreme Court.

We are inclined to believe that Congressional enactment can no more prevent railroads and coal companies from acting in harmony than it can make "parallel and competing" lines quarrel in the public interest, under the outworn assumption that a continuous rate war is a continuous benefit. What it can undoubtedly do is to drive the relationship out of its own sight and reach, and force a roundabout and indirect method of accomplishing what is now done directly and above board. The principal coal carrying railroads, both anthracite and bituminous, are listed below. In the case of the anthracite roads it has been possible to print an estimate—

probably a rough one—of the coal unmined. Two statisticians of the anthracite industry, Griffiths and Ruley, have published such estimates, differing considerably. We use the estimate of Mr. Ruley, because it is the more recent of the two. He makes no separate estimate for the Pennsylvania or the Northern Central, apparently grouping their unmined holdings under the general head of "others."

Principal Anthracite Roads.

	Tons, unmined.*	1905 shipments, tons.
Philadelphia & Reading.†	3,155,000,000	18,600,898
Pennsylvania	.....	15,579,307
Lehigh Valley (including Del., Sus. & S.).	470,000,000	11,157,902
Lackawanna	400,000,000	9,333,069
Delaware & Hudson	260,000,000	5,276,797
Erie	180,000,000	5,711,173
Northern Central	.....	5,050,859
Others	219,000,000	.....

*Estimate of W. W. Ruley.
†Including C. R. R. of N. J., and Lehigh Coal & Navigation Co.

The Philadelphia & Reading Coal & Iron Company is the principal producing company tributary to the Reading; the Lehigh Valley Coal Co. and Coxe Bros., the principal Lehigh Valley companies; the Susquehanna Coal Co., the principal anthracite producer for the Pennsylvania; the Hudson Coal Co., Jackson Coal Co., and D. & H. Co., the principal producers for the Delaware & Hudson; the Pennsylvania Coal Co., Hillside Coal & Iron Co., Blossburg Coal Co., and Northwestern Mining & Exchange Co. supply the Erie, and the Lackawanna owns direct. The New York, Ontario & Western (N. Y., N. H. & H.) also produces some 3,000,000 tons annually through the Scranton and Elkhart coal companies. The Lehigh Coal & Navigation Co., organized in 1822, was the first corporation which engaged in anthracite development.

So far as we are able to ascertain, no statistics of unmined bituminous have ever been prepared. The supply is tremendous, and comes from many parts of the country. The best that can be done is to print figures showing bituminous output and originating tonnage. To accomplish this, letters were sent to all the large carriers of soft coal, and the following table, which is in many respects incomplete, is made up from replies received, supplemented by such statistics as are printed in the companies' annual reports.

Principal Bituminous Roads.

	Tonnage in 1905. Originated.	Carried.
Pennsylvania	48,000,000*	49,130,949
Pennsylvania Company	40,000,000*	44,720,196
Baltimore & Ohio	22,262,717†	20,125,514
P., C., C. & St. Louis	12,000,000*	13,224,459
New York Central	5,300,000*	10,585,577
Norfolk & Western	8,000,000*	8,158,733
Chesapeake & Ohio	7,582,344	7,780,895
Lake Shore & Michigan Southern	Very little.	6,970,313
Erie	No data.	6,900,215
Louisville & Nashville‡	6,252,692	6,377,677
Buffalo, Rochester & Pittsburg	No data.	6,329,743
Southern	No data.	6,114,313
Chicago & Eastern Illinois	No data.	5,551,720
Hocking Valley	3,856,074	5,111,921
St. Louis & San Francisco	4,117,773*	4,627,249
Cumberland Valley	None.	4,050,142
Cleveland, Cincinnati, Chicago & St. Louis	No data.	3,808,462
Vandalia	No record kept.	3,793,325
Toledo & Ohio Central	1,780,827	3,744,671
Missouri Pacific	No data. (1904)	3,599,179
Northern Central	3,000,000*	3,488,802
Boston & Maine	None.	3,044,927
Chicago, Rock Island & Pacific	No data.	2,893,037
Wheeling & Lake Erie	No data.	2,864,736
Michigan Central	No data.	2,693,393
New York, New Haven & Hartford	None.	§2,664,020
Wabash	No data. (1904)	2,512,772
Chicago, Milwaukee & St. Paul	Very little.	2,473,150
Denver & Rio Grande System	2,289,407	2,399,081
Cincinnati, Hamilton & Dayton	No data.	2,222,218
Kanawha & Michigan	1,642,893	1,865,130
Pere Marquette	737,277	1,759,570
Colorado & Southern	1,366,796	1,401,122

*Estimated from best sources obtainable.
†Total bituminous originating on B. & O. and lateral lines.
‡The figures in each column include a small amount of anthracite.
§March 31, 1906.

In addition to these roads, the following large carriers of bituminous should be listed, although they do not furnish information as to their tonnage:

Chicago & North-Western,	Burlington,
Chicago & Alton,	Union Pacific,
Great Northern,	Northern Pacific,
Illinois Central,	Western Maryland.

These statements show two things: the hugeness of the bituminous traffic, and the scarcity of information about it. The roads listed are those which carried 2,000,000 tons or over in 1905, except for a few with less tonnage, which it seemed advisable to include. Even this partial statement records a movement (including some duplication) of 252,987,211 tons of bituminous per year. We shall not be far wrong if we estimate the total annual bituminous movement of the country at 300 million tons.

The Pennsylvania and its interests have a tremendous preeminence both as carriers and as producers of bituminous, and if we include the Baltimore & Ohio, Chesapeake & Ohio, etc., in the community of interest, it will be seen that these roads produce and carry about half the entire amount of soft coal which is moved annually. Which is better—that this movement should be under the through-and-through surveillance of the Interstate Commerce Commission, or that we should have all the complexities of an ownership supposed by the law to be divided?

THE CHICAGO FREIGHT SUBWAY.

Some interesting details of the Chicago freight subway, which has been building quietly for the past five years, part of the time entirely without the knowledge of Chicago's public and even now practically without visible surface evidence of its existence, were printed in the *Railroad Gazette*, July 28, 1905, April 20 and May 4, 1906. The subway will soon be ready for general traffic. Already a moderate amount of business is being done, affording an index of results to be looked for later.

The magnitude and unique character of the project make it one of the most notable and interesting engineering feats ever undertaken in connection with the problem of affording to a great city relief from congested conditions. The Chicago situation is well known to many of our readers. The chief business district is comprised in an area of about 1¼ square miles, being circumscribed on three sides by the lake and rivers. Perhaps a better idea of its extent may be gained from the statement that there are only nine north-and-south streets and eleven east-and-west streets in the section. Surrounding this district are the great railroad terminals and freight houses of the principal roads entering the city. The density of street traffic in this relatively small area is very great, causing highly congested conditions. As a result, teaming transportation is exceedingly slow and correspondingly costly. Other great cities, in this country and Europe, in endeavoring to alleviate congested conditions, have diverted a portion of their passenger transportation below ground, but the pressure of freight traffic through the crowded streets continues unrelieved. Chicago, if its subway proves the practical success that its promoters expect, will have reversed this condition, and a goodly proportion of the heavy teaming traffic will have disappeared beneath the streets. With the heavily-laden, slow-moving trucks and vans off of these now crowded thoroughfares, as well as a reduction in the amount of traffic by lighter vehicles, the problem of surface transportation of passengers obviously becomes simplified.

At the time of opening the subway will have upward of 40 miles of tunnels. Practically every street in the business section is duplicated below the surface. The bores also extend under and beyond the rivers for connection to the railroad freight and passenger terminals. Connections have already been made to most of the freight houses adjoining the district mentioned and other connections are being made or are contracted for. All of the passenger terminal stations but one, and the general postoffice, have already had connections installed for carrying the mails, for which the subway company has a bulk contract with the government. A large number of connections to stores, warehouses, etc., have been made, and these are being increased as rapidly as possible. Connections will be made to all establishments desiring them, which can assure a minimum of 50 tons of freight a day.

The more important of the useful functions the subway is designed to serve are: the transfer between railroad freight houses of less-than-carload freight not too bulky to be loaded into its cars of 15 tons capacity and 2-ft. gage; carriage of merchandise between freight houses and mercantile establishments; delivery of coal to office buildings, stores, hotels, etc., and removal of ashes from same; transmission of newspapers, mail matter, packages and parcels; removal of material from excavations on building sites and debris from old buildings being demolished. Doubtless the most important single functions of the foregoing list will be the transfer of freight and carriage of merchandise. Estimates on this total daily movement in Chicago vary, but it appears to be in excess of 150,000 tons. The subway will undoubtedly receive all of this business it is able to care for. It competes with teaming transportation, and therefore will base its charges on teaming prices, its advantage, of course, lying in the expedition with which the traffic will be handled, the convenience of the facilities with which the articles are received from and delivered to the subway, and the fact that the weather is not in any sensse a factor in the matter. This last advantage is expected to be especially manifest in the transportation of cold storage products from the storage depots to the large consumers.

What the capacity of the subway will be in tons per day no

one attempts to say at present. The effectiveness of the operating scheme is the controlling factor in determining the allowable maximum density of traffic. The scheme being yet untried, there is no precedent on which to base estimates. The officers think they will be able easily to handle 40,000 tons daily on the present mileage. How much in excess of this the scheme is good for will be one of the future developments.

The operating problem has to do with a network of single-track parallel bores crossing at right-angles with two, three or four-way intersections as conditions require; that is, the intersecting lines are joined by two, three or four curves. Each city square below ground therefore is, in effect, a loop around which any train may be diverted in the event of an obstruction of whatever nature on the section (city block) ahead. There are 120 of these loops in the business district. A telephone is placed at each street intersection and building connection, and a switch tender at each street intersection. The maximum train speed is 8 miles an hour. We suppose that certain lines or routes will be designated for movements in given directions to avoid confusion; though just what is planned in this respect we are not informed.

The possible effect of the subway service on present conditions at the freight houses and yards furnishes interesting material for speculation. For instance, the rapidity with which freight to or from the subway can be handled as compared with teams, should, in effect, materially increase present capacities both within the freight houses and on the tracks. The greater expedition with which the railroad cars can be loaded and unloaded will reduce the number waiting to undergo these respective operations. The subway cars will be delivered on the freight house floor and can be moved from one end to the other of the house under power, saving a large amount of trucking and increasing the efficiency of the freight handlers, making it possible to reduce the number necessary to handle a given amount of business. Other advantages occur, but mention of these few will suffice to indicate the possibilities of the project in this respect.

Consideration of the unique character of the subway would be incomplete without reference to the novel methods of excavating building sites and of removal of old buildings in Chicago's business district made possible by its existence. The scheme is simply the removal of the excavated material or the building debris by way of the tunnels instead of the usual teaming method. But in the difference of the two methods is comprehended a convenience and economy that the contractors were quick to appreciate and avail themselves of. In instances where it is desired to occupy a building until the last possible moment before demolition, as with stores, the greater part of the excavations for the new building are made and the footings built before the old structure is torn down; and this with scarcely any surface indication of the work going on below. Also, changes in the methods of erecting the new buildings have been made possible by the subway service. New buildings are going down to the subway level, 40 ft. below the surface, for more convenient access thereto.

The friendly relations of the railroads and the subway is indicated by the personnel of the board of directors, which is made up almost entirely of the highest railroad officers in Chicago. The results, not only to the railroads but to all of the interests involved, from this new system of handling a great city's freight traffic will undoubtedly be watched with interest by the entire commercial world. Chicago's freight subway must unquestionably be a vital factor in the city's future growth.

The official journal of the Russian Ministry of Transportation publishes an elaborate review of the experience of the Russian railroads in carrying grain in bulk, which was introduced 15 years ago. That the shippers have found the method advantageous is shown by the fact that now four-fifths of all the grain shipments are in bulk. But the review finds that the shippers' advantage has been at the cost of the railroads, and enumerates 10 causes therefor, among which are some which make an American railroad man stand aghast. We can understand the necessity for tight and clean cars, and the cost of grain doors, etc., but that loading, unloading and transfers from car to car should take more time and cost more for grain in bulk than for grain in sacks indicates that the Russian railroads have not taken advantage of the appliances so long in universal use here, and which make a return to the sacking of grain unthinkable. Yet in Russia grain forms a larger proportion of the total freight than in any part of this country, except perhaps the western prairie states. One of the Russian railroads carrying grain to a Black Sea port reports that when grain was shipped in sacks it had been able to unload 330 to 400 carloads daily, while the best it can do with grain in bulk is 160 carloads in a day. To discharge a load of bulk grain it takes 90 minutes; of sacked grain, 40 minutes. If Maxim Gorky, who has carried many a sack on his shoulders at Odessa, will visit the elevators and transfer tracks in Chicago he will doubtless be able to tell why.

NEW PUBLICATIONS.

Twenticth Century Machine Shop Practice, 1906. By L. Elliott Brookes. Frederick J. Drake & Co., Chicago. Cloth, 5 in. x 7½ in.; 423 illustrations; 630 pages; including index. Price, $2.

This work is intended for the use of machinists, engineers and others who are interested in the use and operation of the machinery and machine tools in a modern machine shop. The author deals with the various subjects discussed in as practical and non-technical a manner as possible, and where necessary he has gone into academic discussion and has clearly explained the fundamental principles of operation. A number of rules, formulas and tables are also given. These will be found of use in connection with the subject matter of the book, as well as in every-day shop problems.

The Manual of Statistics, 1906. Published by The Manual of Statistics Company, 25 West Broadway, New York. Cloth; 5x8 in.; 1056 pages; 22 maps. Price, $5.00.

The twenty-eighth annual number of this financial publication has just been issued. As usual it contains in condensed form information about railroad and industrial companies and their securities, government securities, and produce and cotton statistics, together with a three-year record of high and low prices of a wide variety of stocks and bonds in different markets. A table at the end of the railroad department sums up for some 60 roads, tonnage, ton mileage, freight density, average rate received, earnings per freight train mile and average train load. Other tables give by years statistics of railroad construction, foreclosures and receiverships together with a list of the railroads sold at foreclosure and for which receivers were appointed in 1905. The book is a convenient handbook of a great deal of condensed information which it makes readily available.

Electric Transmission of Water Power. By Alton D. Adams, A. M. New York: McGraw Publishing Co. Cloth; 6x9 in.; 335 pages; 105 figures. Price, $3.00.

In some respects the title of this book is misleading in that the text is by no means limited to those items of electrical transmission of power that are characteristic of water power developments only. It embraces the whole wide range that may be properly classified as belonging to electric transmission in general, whether the current be generated by water, steam or gas. In this respect the book is of much greater value than its title indicates. The opening chapter relates to water power in electrical supply. There is a brief review here of what has been done in this country in the electric transmisson of water power over moderate and long distances ranging from three to 142 miles. This general rounding up of what has been done is followed by a discussion of the utility of water power, in which it is shown that while "in comparatively few systems is the available water power sufficient to carry the entire load at all hours of the day and during all months of the year," there is still every reason for using that which is at hand. This is demonstrated by concrete instances from experience. There are chapters on the development of water power for electric stations, the location and the design of electric water power stations, all of which are illustrated by examples so that the reader, student or engineer is furnished with ample precedent for contemplated action. These chapters are illustrated not only by pictures of the buildings in which the plants are housed but by maps and plans showing the methods followed in the various developments.

The balance of the book is occupied with a discussion of the general problems of transmission. In one chapter there is an interesting comparison of the relative advantages of direct and alternating current. The method of operating and the means of securing high potentials under either system are fully and clearly explained and the evidence on both sides carefully weighed, though evidently in the mind of the author, the direct-current system presents preponderating advantages; for, in the concluding paragraph he says that "either of the three systems of transmission by continuous-current, that have been considered, requires a smaller total capacity of electrical apparatus for a given rate of mechanical power delivery than any system using alternating current except where both dynamos and motors operate at line voltage."

It is shown that the physical limits of transmission are defined by the voltage that is obtainable and permissible, permissible not only from an electric but a commercial standpoint, for if the "present transmission pressures of 50,000 to 60,000 volts are to be greatly exceeded, the line structure will involve the use of a separate pole for each wire of a circuit." Other matters touched upon and handled with all of the thoroughness possible in a book of such wide scope are alternators, transformers, switches, fuses, circuit-breakers, regulation, guard wires, lightning arresters, materials, voltages and losses, conductors, pole lines, insulators and steel towers.

The book is exceptionally free from mathematics and formulæ

and presents its information in a way that can be readily grasped by any who will take the pains to read carefully.

CONTRIBUTIONS

Grafton, Hall, Patenall et al.

Boston, May 14, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of April 20 you say that "the upward inclination is looking up"; and from what you have said at other times, joined with what is going on in the Railway Signal Association and among the signal manufacturers, one may conclude that the three-position signal is also "looking up"—it is growing in popularity. Does this mean that our signal practice is to be rapidly revolutionized? Let us look around a bit. Are we not going too fast in our craze to refine the semaphpore to some imaginary state of perfection, that is only an incident after all?

The upward inclination and the three-position are both put forward on the plea of economy; the first on the ground that with less counterweight to lift there is less expenditure of energy, and the second on the ground both of economy in battery power and of the reduction in cost of installation by halving the number of blades. But why put such emphasis on these moderate and questionable economies, while we all the time ignore the marked economy of the enclosed disk signal? Experience has shown that these "banjo" signals cost 30 per cent. less to install and 30 per cent. less to maintain. The simplicity of their apparatus is so marked, as compared with the power semaphores used in automatic block signaling, that the wages of maintainers may be and are kept $5 a month lower.

Simplicity and cheapness are two cardinal elements that can never be safely ignored if one intends to adhere to the fundamentals of economy. In exalting the semaphore we are losing sight of these fundamentals. We are indulging in excessive zeal for an ideal, the same as when we try all sorts of schemes to get a third night color for distant signals, in the face of the complete success of the English roads in carrying on their enormous traffic for many years with only two night colors. The fallacy that the semaphore is a necessity because it can be seen farther (in practice it can't) is exploded by the success of the Chicago & North-Western and the Philadelphia & Reading with their hundreds of disk signals for the past dozen years. Does any one know of any roads that have fewer collisions in proportion to signal operations than these two? Or of any road where the enginemen find less fault with the signals?

I have had experience with the enclosed disks through four northern winters; and the days in which the signals have caused delays because hidden by sticky snow on the glass windows of the signal case have not been over four—or one a year. This point about the snow is one of the academic objections, as devoid of real force as that about yellow lights looking like red. The reflection of sunlight by the glass is equally unimportant as a difficulty. Any signal which really causes annoyance in that way can be cured by a slight change in location. As enginemen (and superintendents) come to more generally use and more fully appreciate the distant signal, this alleged sunlight fault, like others depending on the supposed necessity of seeing signals a mile or two before you reach them, vanishes into nothingness.

While I am glorifying the enclosed disk I may as well say a word for the "normal danger." Five years' practice under this, with a considerable though shorter experience with normal clear, has made me a pronounced advocate of normal danger. In this statement I am speaking only from the standpoint of the operating officer. I leave economy to be discussed by others. With normal-danger, whenever you see a signal at clear you know that it has just been put into that position. This affords constantly renewed assurance that the apparatus is in working order; and this constant assurance comes to be a marked satisfaction. It is to be borne in mind that this is a merit in automatic signals which stands on its own bottom. We do not need to depend on the analogy between normal danger here and normal danger in interlocking signals. In interlocking the signals are kept normally in the stop position for convenience and celerity, that is all. In automatic signals it is an important desideratum for another reason—the reason that I have just given.

In fact, from the operating officer's standpoint, all considerations are in favor of the normal danger. Your readers are already informed as to the principal arguments from a technical standpoint; that it is dangerous to neglect flagging with normal clear, because false clear signal indications are more likely to occur than with the normal danger; that the normal danger consumes less battery current; that derangements may be as readily discovered under one system as the other; that the normal danger is really less liable to derangement.

My plea is for rational treatment of the signal question in all of its phases and details. The fundamental element of simplicity, to which I have already referred, includes the question of size. We should not keep on forever using posts 30 ft. high, with large and heavy castings, just because the practice throughout the country has for many years been dominated by men who are determined to make signals visible two miles away. These same men have persistently tried all these years to get along without distant signals, presumably because they thought that that course was a good way to save money. But the distant signal has had to be used, because it is a necessity, and its use is constantly growing, thanks largely to the persistent advocacy of the *Railroad Gazette*. The conservatives (to call them by a mild term) have been beaten. Having been beaten on that point, logic demands that their theories of size be also thrown overboard. On one division of an important road, the automatic disk (clock work) signals for 40 miles are nearly all of the old pattern, with oblong disks about 24 in. long (transversely to the track), and 6 in. to 8 in. high, and they are on posts about 20 ft. high; and these signals are just as satisfactory as semaphore signals that are one-fourth higher, and more than a fourth heavier, larger and more costly. Why do we ignore lessons of experience like this? Automatic signals have been in use on the division referred to for more than 20 years.

The signal manufacturer and the capitalist sitting in the railroad president's chair (usually short-sighted except on purely financial questions) have long had their way in signal matters, and have decided many questions almost solely on their own notions of expediency. It is high time that operating officers put forward more boldly some of the considerations of expediency that arise in the operating department. The disk signal has permanent merit because it can be enclosed and thus be worked by a few ounces of power. The "normal-danger" principle has incontestable advantages because it compels an additional test of the apparatus on the occasion of every movement. Signals should always be of as small size as will satisfactorily serve their purpose, because larger structures are a standing evidence of unnecessary expenditure. N. E. P.

The Collateral Trust Mortgage in Railroad Finance.*

An account of the origin of the collateral trust mortgage is of interest because it furnishes an illustration of corporate ingenuity in the matter of doing illegal things in a legal way. The construction of the Union Pacific Railroad, among others, was subsidized by the United States Government, which took a second lien upon all that company's property to secure its loan. In 1873, in order to prevent the impairment of the government's lien, Congress passed a law prohibiting the Union Pacific from increasing the bonded debt of the property subject to this lien. Now railroads are built largely out of the proceeds of bond sales. The result of this law was that the Union Pacific could build no branch lines or extensions under its charter. If built at all, these branches must be built under separate charters and legally distinct companies. But these companies must be controlled by the Union Pacific, or they might fall into the hands of its competitors. Furtner, the bonds of small subsidiary companies could not be sold directly to the public unless their interest and principal were guaranteed by the parent company, and this the latter could not legally do because that would be placing at least a contingent fixed charge upon its own earnings.

This situation resulted in the Union Pacific 6 per cent. collateral trust bonds of 1879. Legally distinct companies were organized and chartered to build the desired branches. The Union Pacific advanced the funds with which to construct these lines out of its current earnings, and received in compensation the capital stock and first mortgage 7 per cent. bonds of the smaller companies, which thus became subsidiary. To reimburse its treasury for these advances, the Union Pacific mortgaged these first mortgage bonds, and issued and sold about $7,000,000 of collateral trust bonds against them. The interest on this collateral was more than sufficient to pay the interest on the 6 per cent. bonds, so that, as long as the subsidiary companies did not default in their interest payments, the charges against the revenues of the parent company were not increased, while at the same time it was getting the benefit of a profitable interchange of traffic with those companies. Thus did the Union Pacific accomplish the feat of constructing, eventually without cost to itself, branch lines which were directly under its control, and at the same time of living up to the letter of the national statute.

Three years later, when the Union Pacific created a second collateral trust issue for a similar purpose, suit was brought by a stockholder to prevent the issuance of the bonds, upon the ground that this really increased the funded burden of the Union Pacific property, and, therefore, was in violation of the national statute. It was shown, however, that the plaintiff, although a stockholder at a time previous to the date of this bond issue, had sold his stock and had not again become a shareholder until after the new bond issue had been authorized. The court decided that he had no right of action, so that the real point of the case was never judicially considered.

The idea of the collateral trust mortgage was probably sug-

*From a paper by Thomas W. Mitchell in the *Quarterly Journal of Economics*.

gested by the practice, long current among stock brokers, business men generally, and railroad companies as well, of borrowing upon corporate securities as collateral. Such debts, in the form of ordinary promissory notes, ran for short periods of thirty or sixty days only. The question is naturally suggested, If such collateral is adequate security for ordinary commercial paper, why would it not also be adequate security for long-time loans?

The collateral trust mortgage soon became popular and was used for a variety of purposes. The most important of these have been to fund floating debts, acquire control of connecting railroad lines, and to finance new construction. Out of seventy collateral trust issues about which inquiry has been made for the present investigation, eleven have been made for the first of these purposes—funding troublesome floating debts. Some of these have been due to the misfortunes of the railroad company, some to new construction for which funded obligations had not yet been created, some to both. Thus poor crops in Kansas and Nebraska in 1886 and 1887, strikes and general labor agitation, caused the Atchison, Topeka & Santa Fe to incur a floating debt of $5,000,000 in 1888. A strike, a flood, assisted by a general business depression, caused the Baltimore & Ohio Southwestern a floating debt of over $1,000,000 in 1897. The Richmond & West Point Terminal Railway and Warehouse Company repeatedly piled up floating debts because of the general unprogressiveness and lack of efficiency in the management of the railways which it controlled. Illustrations of floating debts due to construction were those of the Central Railroad and Banking Company of Georgia in 1887, and of the Missouri Pacific prior to 1895. The former piled up a 6 per cent. floating debt of $1,050,000 in building roads in South Carolina, and funded this into a 5 per cent. collateral trust mortgage. The Missouri Pacific had been building railroads with materials bought on account or on commercial paper. All of the floating debt thus created had been bought up by Jay Gould, Russell Sage and other directors, and held by them subject to call. This debt resulted in the Gold Funding Notes of 1895.

The manner in which this method of funding floating debts becomes available may be illustrated by the case of the Richmond & West Point Terminal Company in 1883. That company had acquired control of a network of railroads in Virginia, Tennessee, Georgia and the Carolinas, by purchasing their capital stock and bonds. Almost invariably these had been obtained in exchange for its own capital stock, so that these securities of subsidiary companies lay in the Terminal Company's treasury, unencumbered by any mortgage. When the company found itself burdened with a large floating debt in 1883, it relieved itself by pledging a great mass of these shares and bonds as security for its 6 per cent. two-year collateral trust notes.

The old Wabash, St. Louis & Pacific funded a similar floating debt in 1883. That company had been seized with the mania for expansion. Organized in 1879, it had in three years' time increased its mileage from 1,578 to 3,518 miles, its debt from thirty-five to seventy millions, and had accomplished this partly by construction under subsidiary companies, mostly by annexing all the odds and ends of railroad lines lying loose in its vicinity. In the same process it had collected a large and miscellaneous mass of railroad securities in its treasury. Aided by destructive washouts, poor crops and the poor condition of the roads acquired, it had piled up a floating debt of over $5,000,000. About $18,000,000 worth of these stocks and bonds were bundled together under a collateral trust mortgage and $10,000,000 of 6 per cent. notes issued against them, part of which was to provide for this floating debt and part to pay off certain car trust certificates which were to mature during the ensuing nine years.

These bonds of the Wabash were to run thirty years. Usually, however, the securities issued to take up a floating debt have a period of only three or four years, and are called collateral trust notes. The Richmond & West Point Terminal notes of 1883 matured in 1885, and were converted into another collateral trust issue bearing 7 per cent., and maturing in 1887; the Atchison notes of 1888 were to run only three years; the Union Pacific Collateral Trust Notes of 1891, three years; those of the Northern Pacific of 1893, five years.

The reason for the temporary nature of these issues is apparent. They are created when the railroad company is in financial distress, when its credit is poorest. Consequently, these notes must either bear high interest rates or sell at a large discount, or both. The first collateral trust loan of the Richmond & West Point Terminal in 1883 bore 6 per cent., and was negotiated at 90, representing a cost of 11 per cent. per annum. Its successor in 1885 bore 7 per cent. The Atchison notes of 1888 bore 6 per cent., and netted the company 97½. The Union Pacific notes of 1891 bore 6 per cent., and were taken at 92½, representing a cost of 8 per cent. per annum. The railroad company feels that by tiding over the temporarily unfavorable condition of its finances it can place its long-time securities at lower interest rates. Hence these short-time notes.

So much for the floating debt as leading to this form of security. A more important purpose of the collateral trust mortgage is to serve as a means of acquiring control of connecting lines. There are three ways in which this may be accomplished, namely: (1) One railroad company may purchase a controlling interest in the securities of a second company, paying for them in cash, and reimburse itself by mortgaging the securities thus purchased and selling collateral trust bonds against them; (2) the purchasing company may exchange its collateral trust bonds directly for the desired securities of the second company, and deposit these securities obtained in the exchange under the collateral trust mortgage; (3) the trustee of the mortgage may sell the collateral trust bonds on the market, and with the proceeds purchase the desired securities of the connecting lines and deposit them under the mortgage.

The first method, the cash purchase, will usually be followed when there is reason for a quick purchase of the desired securities. Thus, during the panic of 1893, the preferred and common stock, the second mortgage and equipment trust bonds of the Chesapeake, Ohio & Southwestern took a sudden and large drop. The Illinois Central snatched them up at their low prices, at the same time buying that company's floating debt and overdue interest coupons, and thus obtaining control. This move gave the Illinois Central an outlet from Memphis toward the Northwest for the traffic coming up over its Yazoo & Mississippi Valley division, and also connected that division of its system with the main line at Fulton, Ky. The Illinois Central reimbursed itself for these cash appropriations by selling an issue of collateral trust bonds secured by a mortgage upon the Chesapeake, Ohio & Southwestern securities.

Again, in 1892, the Illinois Central purchased $35,236,000 of the mortgage and income bonds of the Louisville, New Orleans & Texas Railroad, which paralleled its Yazoo & Mississippi Valley division. By the terms of the agreement it was required to pay $5,000,000 of the purchase price in cash. To pay the remainder of the purchase price of $25,000,000 and to reimburse itself for this cash payment, the Illinois Central mortgaged the securities purchased, and issued $25,000,000 of collateral trust bonds against them.

In other cases the companies owning the desired connecting lines may have only a small amount of securities outstanding, so that these may be purchased for cash without inconveniently draining the purchasing company's treasury. The Reading Company in 1899 purchased most of the $1,500,000 capital stock of the Wilmington & Northern at from $40 to $50 per share ($50 par value), and reimbursed itself in the following year by an issue of $1,300,000 of 4 per cent. collateral trust bonds.

A more common practice in acquiring control of connecting lines is to exchange the collateral trust bonds directly for the stocks and bonds which are desired, and which become the security of the collateral trust bonds. This exchange is made at a fixed ratio stated in terms of the par value of the two sets of securities, usually offering the holders of the desired securities a little more than the market price of their holdings at the time. Thus, in 1902, the Chicago, Rock Island & Pacific Railroad Company, wishing to acquire the capital stock of the Chicago, Rock Island & Pacific Railway Company, offered the holders of that stock its collateral trust 4 per cent. bonds, together with the common and preferred stock of the Rock Island Company of New Jersey, in the ratio of $100 in bonds, $70 in preferred stock, and $100 in common stock for each $100 of capital stock of the railway company. The Railway company's stock, which had been paying 5 per cent. dividends, had risen in market price from 135 in July, 1901, to 170 in June, 1902, and thence to 200 later in the year. The securities for which these stocks were exchanged guaranteed their holders 4 per cent. on the par value of their investment in the form of interest on the collateral trust bonds, an additional 2.8 per cent. if earned as dividends on the preferred stock, in all a possibility of 6.8 per cent., and gave them a bonus of common stock. Rock Island Company's preferred stock commenced paying 4 per cent. dividends in 1903; but its ability to continue this is contingent upon the old Railway company's ability to continue paying more than 7 per cent. dividends on its stock, which, in view of the present inferior condition of its property, is improbable.[1]

Again, in 1902, to acquire the stock of the Choctaw, Oklahoma & Gulf Railroad, the Chicago, Rock Island & Pacific Railway Company offered the holders of that stock its 4 per cent. collateral trust bonds at the rate of $80 in bonds for each $50 share of Choctaw common, and $60 in bonds for each $50 share of Choctaw preferred. The preferred stock had been paying 5 per cent. dividends since 1898, and the common from 2 to 4 per cent. This was not in itself an attractive offer to the preferred shareholders; but they had either to accept this offer or furnish large amounts of funds for betterments and extensions, besides withstanding the competition of a parallel line which the Rock Island threatened to build if they refused this offer. They accepted.

The third method of purchasing the securities of another railway company is illustrated in the Richmond & West Point Terminal mortgage of 1887. The "Terminal Company," which had hitherto been subsidiary to the Richmond & Danville, wished to acquire the $6,000,000 of first preferred stock of the East Tennessee, Virginia

[1]Since the above was written, the Rock Island Company has been compelled to reduce the dividend on its preferred stock.

& Georgia and a controlling interest in the Richmond & Danville stock, and thus to become the parent company. For this purpose $4,400,000 in cash was required, in addition to 40,000 shares of the "Terminal Company's" stock. To obtain this cash and fund a floating debt, a mortgage for $8,500,000 was placed upon a list of stock and bonds, including the "East Tennessee" and the Richmond & Danville stock about to be purchased, the list amounting to $21,416,000. The collateral trust bonds thus secured were delivered to a syndicate in exchange for the necessary cash funds, the syndicate reimbursing itself from the sale of the bonds. In other cases the trustees of the mortgage sell the bonds, and from the cash proceeds purchase the desired railroad securities and hold them subject to the mortgage.

So much for the methods of purchasing the securities of connecting railroads. Twenty-nine out of about 70 collateral trust issues were created wholly or in part for this purpose. Other methods of acquiring control of connecting lines are through the lease of their roads, consolidation, and common personal ownership of the stock of the two companies. The lease is the most common. But if a fixed rental is paid for the leased line, this becomes burdensome to the lessee if the acquired line should prove unprofitable or during times of depression. If the rental be a fixed percentage of the gross or net earnings, thus fluctuating with the prosperity of the leased line, this in practice has been found to discourage improvements by the lessee upon the leased property, because the lessee will not get the whole benefit of such improvements. As a result, many companies are supplementing their leases by purchasing the stock of the leased lines, or are purchasing this stock and canceling or refusing to renew their leases. The Illinois Central adopted the latter course in dealing with its Iowa lines in 1887. The Mobile & Ohio, in 1900, supplemented its lease of the St. Louis & Cairo Railroad by purchasing that company's stock under a collateral trust mortgage. Very frequently a railway company, after obtaining a controlling interest in the stock of a connecting line, will also lease its road. This enables the parent company to operate the leased road as an integral part of its system.

In "consolidation," as the term is here used, one company loses its identity, its property being sold to the other company in consideration of the assumption of its debts by that company, or distributed to its stockholders, which consist of the parent company. The method of consolidation is rarely followed in practice. It has the advantage of simplifying accounts by avoiding the necessity of keeping a distinct set of accounts for each part of the system. But a connecting line may become a burden instead of a blessing to the system, and under consolidation there is no way in which to remove such a burden except insolvency and reorganization. whereas, if control is exercised through stock ownership, the burdensome line may be dropped off by redeeming the collateral trust mortgage and selling the underlying securities.[1] Further, consolidation may lead to legal complications. There is always that danger that the courts will declare the consolidation illegal; and, since a case testing its legality may not come up at once, but several years later, when everything has been adjusted to the new order, it is considered advisable not to resort to this method of control. Finally, in case a consolidation were declared illegal, there is still grave doubt as to the charter rights of the consolidated company. Thus the present Chicago, Rock Island & Pacific Railway Company was a consolidation of the former Chicago, Rock Island & Pacific Railroad Company, an Illinois company, and the Mississippi & Missouri River Railroad Company, an Iowa corporation. The laws of Illinois forbid a railroad company from purchasing and owning the stock of another corporation; the laws of Iowa permit it. What rights are possessed by the present Rock Island Railroad Company, which is a corporation under both sets of laws? Does it possess the most liberal provileges conferred by each charter or the least liberal? As a matter of practical policy, the solicitors of the company will claim all the privileges they ever enjoyed under either charter; but there are abundant opportunities for legal complications.

Control through common personal ownership in the stock of two or more railroad companies was, until recently, illustrated in the method by which the Vanderbilt system was held together. The parts of this system, including the New York Central, the Lake Shore & Michigan Southern and the Michigan Central, were operated in harmony because the Vanderbilt family held a controlling interest in the share capital of each company. This has its disadvantage in that the death of a single individual may cause the break-up of the whole railroad system. In 1898 and 1900 the New York Central purchased the Vanderbilt holdings in the stock of the other two companies, and as much of the remaining stock as was offered, paying for them in 3½ per cent. collateral trust bonds secured by the stock purchased.

This case illustrates a third purpose for which collateral trust bonds may be issued; namely, to more firmly cement the parts of a railroad system together. In this case common personal ownership was converted into corporate ownership. In other cases separate holding companies may be organized to acquire and hold the securities of connecting lines. The old Richmond & West Point Terminal Company, which was organized in the interests of the Richmond & Danville, was an instance of this kind. Or, as in the case of the Erie Railroad's purchase of the New York, Susquehanna & Western and several other companies in 1901, the collateral trust mortgage may be the means of converting close but informal working agreements with connecting lines into actual control.

We come now to the most important purpose for which bonds in general have been issued, and the purpose second in importance for which collateral trust bonds have been issued. That purpose is the financing of new construction. The general practice in building extensions and branch lines nowadays is to construct these under separate charters. But, instead of selling the securities of the new railway company upon the market, these securities are issued to the parent company, and the latter places upon the market its own collateral trust bonds secured by a mortgage upon these stocks and bonds of the subsidiary company. This course secures the necessary construction funds as readily and insures to the parent company the control of the new lines.

In practice this method works itself out in two variations. The parent company either advances the necessary construction funds out of its own treasury in exchange for the securities of the subsidiary company, and later reimburses itself by the sale of collateral trust bonds, or, in advance of construction, it gives its collateral trust bonds to the subsidiary company in exchange for the latter's stock and bonds; and the subsidiary company then obtains the needed construction funds by selling the collateral trust bonds thus received.

The collateral trust mortgage issued by the Union Pacific in 1879, already referred to as probably the earliest issue of the kind, was an instance of the first variation. The $14,376,000 of trust 5 per cetn. bonds of the Missouri Pacific Railway in 1887 was another instance, and were secured by the first mortgage bonds of seven subsidiary companies. A similar collateral trust mortgage of 1890 was secured by the bonds of 19 subsidiary companies which were built in this way. The Illinois Central and the Louisville & Nashville are also among railroad companies which have financed new construction in this way.

The variation has the disadvantage of entailing a considerable drain upon the earnings and working capital of the parent company, perhaps impairing its working efficiency, and especially diverting funds which might have been paid out in dividends to other purposes. And in practice it seems to be less favored than the second variation, namely, the exchange of securities with the subsidiary companies and the sale of the collateral trust bonds in advance of the construction work.

The latter has been a favorite method with the St. Louis & San Francisco, that company having put out four issues of collateral trust bonds in this way. Other railroad companies which have followed this method are the Burlington (1881), the Rock Island (1884), Illinois Central (1886), the Atchison, and the Union Pacific. This method was also followed by the Pennsylvania Company in putting out its guaranteed trust certificates in 1897 and following years. By following this method the drain on the parent company's treasury was reduced to a minimum, namely, the interest upon the bonds issued.

The reasons for financing new construction by means of collateral trust issues are various. To construct new lines under the parent company's charter would often mean that they would automatically become subject to old mortgages. This means that new bonds issued would have a junior lien, and, as the *Commercial and Financial Chronicle* puts it, an investor prefers a first lien upon a specific piece of property to a tenth or twelfth mortgage upon a whole system. If subsidiary companies are organized, these must be controlled either through the lease of their lines or through stock ownership. The first mortgage bonds of the subsidiary companies might be offered directly to the public; but the investor prefers a bond which, in addition to being a first lien upon a specific piece of property, is a direct obligation of the parent company. The collateral trust bond has both of these desirable qualities, and gains additional strength from the fact that frequently the same bond is thus indirectly a first lien, not upon one branch road only, but upon several, thus widening the security. As in insurance, there is safety in numbers.

Again, as already intimated, the control of connecting lines through stock ownership is a possible advantage in that it may enable the latter to rid itself of such lines if they prove unprofitable. Sometimes a subsidiary company can obtain valuable charter privileges. The Rock Island built the road of the Wisconsin, Minnesota & Pacific under an old charter which exempted its stockholders from the liabilities imposed by the states through which its lines passed.

But the most important reason for constructing additional mileage in this manner consists of the limitations of the parent company's charter privileges. In the first place, a railway company's charter will pretty definitely fix the location and length of the road which may be constructed by it. Thus the Illinois Central's charter empowered it to construct a railroad from Cairo, Ill., through the

[1]This is not true, however, if the interest on the subsidiary company's bonds or dividends on its stock be guaranteed by the parent company.

central part of the state to the northwest angle via Galena, and a branch from Centralia to Chicago. If that company wished to construct other mileage within the state, it might be enabled to do this through an amendment to its charter; but in these days of hostility toward corporations it might have to surrender some other valuable charter privilege in exchange for the desired amendment. Further, the powers granted to a railroad company in its charter hold only within the boundaries of its birth state; and, if it wishes to push its lines into other states, as all great railroad systems do, these lines must be built under separate charters obtained under the laws of the states in which they lie. Hence a great railroad system must consist of the lines of a number of smaller or of larger companies, all of which are controlled in some way by one great "parent" company. As shown before, where these subsidiary companies sell bonds—and they usually do—these bonds will command better prices if they are represented in the market by the parent company's collateral trust bonds.

The foregoing three purposes, namely, funding floating debts, purchasing control over connecting lines and financing new construction—are the principal purposes for which collateral trust mortgages have been created. Of these, the last two, which together represent the building and development of railway systems, are *par excellence* the purposes of the collateral trust mortgage. Fifty out of about 70 such mortgages have been created, wholly or in part, for one of these two purposes. The funding of floating debts comes next with 11 such issues to its credit. A few of the more important minor purposes are illustrated in the following paragraphs.

One such purpose of the collateral trust mortgage is to market the companies' securities on more favorable terms than could be obtained otherwise, either by postponing the sale of long-term bonds until market conditions become more favorable or by combining a number of different bond issues and strengthening their security, to give strength to the combination. In the first case the new issue usually takes the form of collateral trust notes which bear a higher rate of interest than the underlying securities, and are exceeded by them in par value. Thus the Baltimore & Ohio Southwestern had sustained during 1896-97 a series of disasters which impaired its earnings, so that its first consolidated 4½ per cent. bonds had declined from 79 to 60. Being in need of funds with which to repair the damages to its track, that company deposited a number of these 4½ per cent. bonds as security for $675,000 of notes, which were turned over to a syndicate in exchange for the needed funds.

On the border between this and the next case are the several collateral trust issues put out by the Seaboard Air Line Railway Company between 1900 and 1903. The Seaboard Air Line Railway Company had authorized in 1900 a $75,000,000 issue of 4 per cent. bonds, which were a first lien on 350 miles of railway, and a direct mortgage on 1,010 miles of other road, subject to outstanding prior lien bonds amounting to $12,748,000, and was a consolidated lien on the remaining mileage of the Seaboard system. The security was not strong enough to sell the bonds. Consequently, as funds were needed, three successive collateral trust issues were substituted. In each of these there was deposited an amount of the unsalable "first fours," just double the amount of the collateral trust notes or bonds authorized. Two of these collateral trust issues bore 5 per cent. and one 6 per cent., as compared with the rate of 4 per cent. on the underlying bonds. The collateral trust bonds sold at from 100 to 105 as compared with a price of 82 to 90 on the underlying bonds. The Chicago & Alton Railway Company did a similar thing in 1902, issuing $5,000,000 of 4 per cent. notes against $7,000,000 of 3 per cent. refunding bonds of the Chicago & Alton Railroad Company.

In 1898 the Louisville & Nashville's unified 4 per cent. bonds were selling at from 80 to 90. Wishing to pay off over $7,000,000 of first consolidated mortgage bonds which matured that year, the Louisville & Nashville placed a 20-year mortgage upon $14,000,000 of these unified fours and $4,000,000 of Paducah & Memphis division bonds, and issued 4 per cent. collateral trust bonds against them. These bonds sold around par. The Louisville & Nashville collateral trust bonds of 1882 were issued for a similar purpose. In this case $10,000,000 of 6 per cent. bonds were issued against $28,163,000 par value of a varied list of bonds, and sold at 90.

Still another purpose of collateral trust bond issues is the reduction of fixed charges. This may be done by converting flexible rentals into fixed interest rates. Thus, in 1900, the Mobile & Ohio purchased the stock of the St. Louis & Cairo, whose line it had leased at a rental amounting to 25 per cent. of $^{150}/_{640}$ of its gross earnings, thus substituting a fixed interest charge for this flexible rental. Or bonds with a low rate of interest may be substituted for preferred stocks with fixed dividend rates. Thus the 3½ per cent. guaranteed trust certificates of the Pennsylvania Company take the place of the 7 per cent. special stock of the Pittsburg, Ft. Wayne & Chicago, which dividend is guaranteed by the Pennsylvania Railroad.

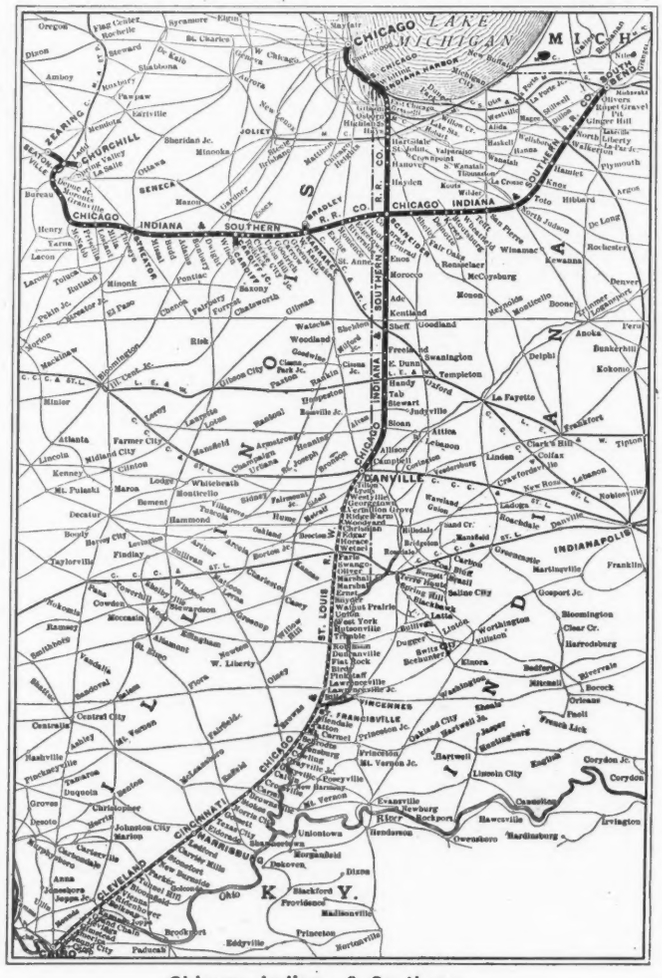
Three other purposes of collateral trust issues need only be mentioned. These are: (1) To refund previous issues of bonds, (2) to convert a previous bond issue for the purpose of increasing its authorized amount, and (3) to consolidate and unify the mortgages of railroad companies which enter into consolidation. The usual method of accomplishing each of these purposes is by means of a consolidated or general mortgage. The use of the collateral trust mortgage in this way is very exceptional.

Chicago, Indiana & Southern.

The accompanying is an official map of the Chicago, Indiana & Southern, the New York Central line formed by consolidation of the Indiana, Illinois & Iowa, or, as it was familiarly known, the "Triple Optic," running from Zearing, Ill., east to South Bend, Ind., 200 miles, and the Indiana Harbor Railroad, which in January of this year was extended southward 109 miles from Indiana Harbor, Ind., on the lake shore, 19 miles from Chicago, to Danville, Ill., the northern terminus of the Cairo division of the Big Four.

The two roads were in April consolidated into the new company, the name Indiana Harbor Railroad now covering only the Indiana Harbor Belt, not shown on the map, which, having on Feb. 1, 1905, taken over the rights of the Michigan Central in the tracks of the Chicago Junction Railway and two short belt lines, operates 70 miles of belt line from Indiana Harbor, Ind., to Franklin Park, Ill.

The advantages of the new Indiana Harbor-Danville line to the New York Central system are three-fold. It reaches valuable coal fields which are expected to furnish a large part of the coal supply of the lines east from Chicago. As shown on the map, it gives



Chicago, Indiana & Southern.

a direct connection over Vanderbilt rails to Cairo, at the junction of the Mississippi and Ohio rivers, which is expected to compete effectively for traffic to and from the Gulf. To carry out this plan, large improvements have been made on the Cairo division of the Big Four, and the North & South Despatch Line has been organized to run over this line, the Mobile & Ohio and the New Orleans & Northeastern to New Orleans. It is 389 miles, Chicago to Cairo, by this line against 365 miles by the Illinois Central and 942 miles, Chicago to New Orleans, against 923 by the Illinois Central. By running over the new line into Chicago from Sheff, Ind., where it crosses, the Big Four would, instead of as at present using Illinois Central trackage from Kankakee into Chicago, for 56 miles, and the Illinois Central station in that city, be able to enter the city over Vanderbilt rails and run into the La Salle Street station now used by the Lake Shore and the Nickel Plate. The Chicago, Indiana & Southern is an unusual railroad in being made up of two lines running practically at right angles to each other.

How to Get Your Percentage of Competitive Business.*

When up town, visit your merchants. There is always liable to be something somewhat wrong, and if it is with the other line, they will tell you about it, advise you what they have ordered and where from, and will let you have their business for the asking. If it is something wrong with your line, you should look after it at once and make every effort to adjust it. Many times a small claim promptly adjusted has a most beneficial effect.

Make a practice of watching all teamsters. The carload shipments are hauled by certain teamsters; be accommodating to them, having a kind word, placing cars where they can get to them handy, let them know that you appreciate the fact that they are trying to load and unload cars promptly and they will help you out in getting the cars, and will also prove a valuable source of information concerning shipments they have handled or that are expected.

The merchandise is also handled by certain teamsters daily. Keep yourself informed regarding their loads, and you will be able to arrive at pretty clear conclusions as to tonnage and shipments.

It is also a good plan to watch the other road's side tracks. Many times you will see loads that you have not been able to learn of from the teamsters or in any other way.

The mail order shipments are also easily watched and may also be secured. The farmers frequently ask for rates and other information on the street or over the telephone. Then is the time to give them all the information they wish and at the same time solicit the business for your line. Tell them all that they are able to ask, and even more. It places them in a position to favor your line with the business. When the shipment arrives, notify them promptly, and when they call for it go to the wagon with them, and if overweighed or in bad order, fix it up the best way possible. In doing these things, they frequently tell you of shipments they or their neighbors have received via your line and other lines, whether the service was satisfactory and what future shipments they are expecting and via what line.

The traveling salesman is also a man that can give you a great deal of information. Accommodate him, and when possible he will reciprocate. A visit with him will be of benefit to you. Get acquainted with him and he will give you many shipments which, not being routed by the buyer, he is in a position to control for you. He can also give you information concerning sales and tell you of merchants from whom you may secure future shipments.

*From an address to station agents, by M. A. Winkel, Agent of the Chicago & North-Western at Algona, Iowa, delivered before the Agents' Association at Fox Lake, and published in the *North-Western Bulletin*, No. 3.

New Railroad Law in Ohio.

In establishing a Railroad Commission of three members, in place of the single officer now performing the functions of that office, the Legislature of Ohio passed an elaborate law to regulate the conduct of railroads and the charges which they shall make for transportation. This law has 38 sections and an abstract of its provisions follows.

Sec. 1. A Railroad Commission is created, to be composed of three commissioners; each commissioner's term is for six years from the first Monday in February, one to be elected every two years. One commissioner shall have a general knowledge of railroad law, and each of the others a general understanding of matters relating to railroad transportation. Not more than two can be of the same political party. No commissioner nor the secretary shall do any other business or serve on or under any committee of any political party. Salary of commissioners, $5,000 each; salary of secretary, $2,500; two clerks, $1,000 each, and one expert stenographer, $1,200. The commission may appoint necessary experts and inspectors. Inspectors shall have the right to inspect freight in cars or in freight houses; and to inspect waybills and other papers. All hearings shall be open to the public. The commission may attend conventions with the commissioners of other states.

Sec. 2. The term "railroad" shall embrace all railroads, receivers, etc., and express companies, but not companies engaged exclusively in the sleeping car business. The act does not apply to street and electric railroads engaged solely in the transportation of passengers within the limits of cities, nor "other private railroads" not doing business as common carriers.

Sec. 3. Every railroad is required to furnish adequate facilities and its charges must be just.

Sec. 4 requires tariffs to be filed with the commission and kept in stations accessible to the public. Tariffs, both local and joint, may be changed only on ten days' notice to the commission unless the commission allows a less time, and whenever a change is made a notice shall be posted in a conspicuous place in every station showing what the changes are and when they take effect. Charges greater or less than specified in the tariff are unlawful. The commission may prescribe the forms of tariffs, which must, as far as practicable, conform to the forms prescribed by the Interstate Commerce Commission.

Sec. 5. Joint rates must be just and reasonable, but each road may charge less than its local rate to or from the junction.

Sec. 6 allows commodity, concentration and other special contract rates, but these must be open to all shippers alike, and the rates are subject to the regulation of the commission.

Sec. 7. The classification of freight in the state shall be uniform on all railroads.

Sec. 8 provides for free transportation in certain cases and allows mileage and party tickets. Men in charge of livestock may be carried free both ways, subject to regulations made by the commission.

Sec. 9. Every railroad must maintain adequate depots and side tracks.

Sec. 10. Every railroad shall, when within its power, furnish suitable cars for carload lots on reasonable notice. In case of insufficiency of cars, distribution must be made to applicants in proportion to their respective immediate requirements, but preference may be given to livestock and perishable property. The commission may enforce regulations for furnishing cars, for switching, for loading and unloading, and for weighing.

Sec. 11. All steam railroads, as between themselves, and all interurban and electric railroads, as between themselves, shall afford reasonable facilities for interchange of traffic; precedence may be given to livestock and perishable freight. The commission controls private tracks in so far as used by common carriers.

Sec. 12.—Upon complaint of any person, firm, association, etc., of unreasonable rates, the commission may notify the road and, after ten days, proceed to investigate. It may enforce the attendance of witnesses. If, on investigation, a rate or practice is found unreasonable, or the service inadequate, the commission may order such rates or practices as it shall have determined to be just and reasonable; and what the commission prescribes the roads must do.

The commission may investigate on its own motion rates or practices believed unreasonable.

Sec. 13 empowers the commission to compel the attendance of witnesses and to call on the court of common pleas for aid where necessary. Witnesses shall receive fees for attendance and mileage, but witnesses subpoenaed at the request of others shall not be paid by the state except on approval of the commission. A full and complete record shall be kept of all proceedings and all testimony shall be taken down by the stenographer. A copy of the record of an investigation shall be furnished free to any party to the investigation and to other persons on payment of a reasonable amount.

Sec. 14. Whenever, on investigation, a rate is found unreasonable, or unjustly discriminatory, the commission shall issue its order fixing a reasonable rate or regulation, etc., and all railroads affected shall conform.

Sec. 15. Rates, etc., fixed by the commission are *prima facie* lawful for one year, unless modified by the commission or by the procedure of Section 16.

Sec. 16. Any railroad or other party aggrieved by an order may within 60 days proceed against the Commission in the Court of Common Pleas. The court may admit other interested parties within ten days after the service of the complaint. Actions under this section have precedence over any civil cause of a different nature pending in the court. If on trial new evidence is presented, the court shall send the evidence to the commission and postpone action for 15 days. Either party to an action may within 60 days appeal from the judgment of the court. In all cases under this section the burden of proof shall be on the plaintiff.

Sec. 17. No person shall be excused from testifying or from producing papers on the ground that his testimony would incriminate him, but he shall not be prosecuted on account of his testimony.

Sec. 18. The commission may inquire into the management of the business of all railroads and shall keep itself informed as to their methods. The commission shall prepare suitable blanks for the purposes designated in this act, which blanks shall conform, as nearly as practicable, to the forms prescribed by the Interstate Commerce Commission.

The Commission or its agents may inspect the books of any railroad on demand and examine under oath any employee. The commission may require a railroad to produce books and records kept by it outside of Ohio, or verified copies thereof. Penalty for refusal, $100 to $1,000.

Sec. 19. Every railroad shall send to the commission copies of all contracts relating to transportation or any service in connection therewith.

On the first Monday in February every railroad must file a verified list of all passes and reduced rate tickets issued, with names of recipients, the amount received for reduced rate tickets and the reason for issuing.

Sec. 20. Every railroad shall, before September 15 each year, send in a true statement of its affairs relative to the State of Ohio, similar to that which it sends to the Interstate Commerce Commission.

Sec. 21. The Commission shall, on complaint, investigate rates

on interstate traffic and, if necessary, petition the Interstate Commerce Commission for relief.

Sec. 22. If any railroad or agent demands or accepts a greater or less compensation than prescribed by the tariff, the railroad shall be liable to a fine of $100 to $5,000 and the agent to a fine of $50 to $1,000. It shall be unlawful for a railroad to make a discount in consideration of the shipper furnishing part of the facilities of transportation.

Sec. 23 forbids discrimination between persons or localities or kinds of traffic.

Sec. 24 forbids any person or firm to accept a rebate or to give false weights, etc.; penalty $50 to $1,000.

Sec. 25. If any railroad shall do or omit anything contrary to this law it shall be liable to the party injured in treble the amount of damages sustained.

Sec. 26. Any railroad employee refusing to fill out and return blanks, or giving a false answer, is guilty of a misdemeanor; fine $100 to $1,000; also, a fine against the railroad of $500 to $1,000, if the employee acted in obedience to the direction of a general officer.

Sec. 27. Any railroad violating any provision or failing to put in operation a joint rate, or do anything wrong for which a penalty has not been provided, shall forfeit $100 to $10,000.

Sec. 28. Whenever the commission, after hearing, finds any charge, regulation or practice unreasonable, it may regulate the same, though the thing done be not specifically mentioned in this law.

Sec. 29 requires immediate notice to the commission of accidents attended with loss of human life, and the commission may investigate the accident, if the public interest requires it.

Sec. 30. The commission shall inquire into any neglect of the laws of the state; shall enforce this act, and all other laws relating to railroads, and report to the Attorney-General, and he must prosecute. He also must be counsel in any proceeding prosecuted or defended by the commission.

Sec. 31. If a railroad does not accept a claim for loss, damage or overcharge, within 90 days, the commission may investigate and make the facts public.

Sec. 32. Acts of the commission shall not be held illegal by reason of technical omissions.

Sec. 33. This act does not release any right of action under other laws.

Sec. 34. The commission may compel compliance by proceedings in mandamus, injunction or other appropriate remedy.

Sec. 35 requires tariffs to be filed within 30 days.

Sec. 36 abolishes the present railroad commissionership.

Sec. 37 declares each section of this act independent, so that the holding of one section void shall not affect other sections.

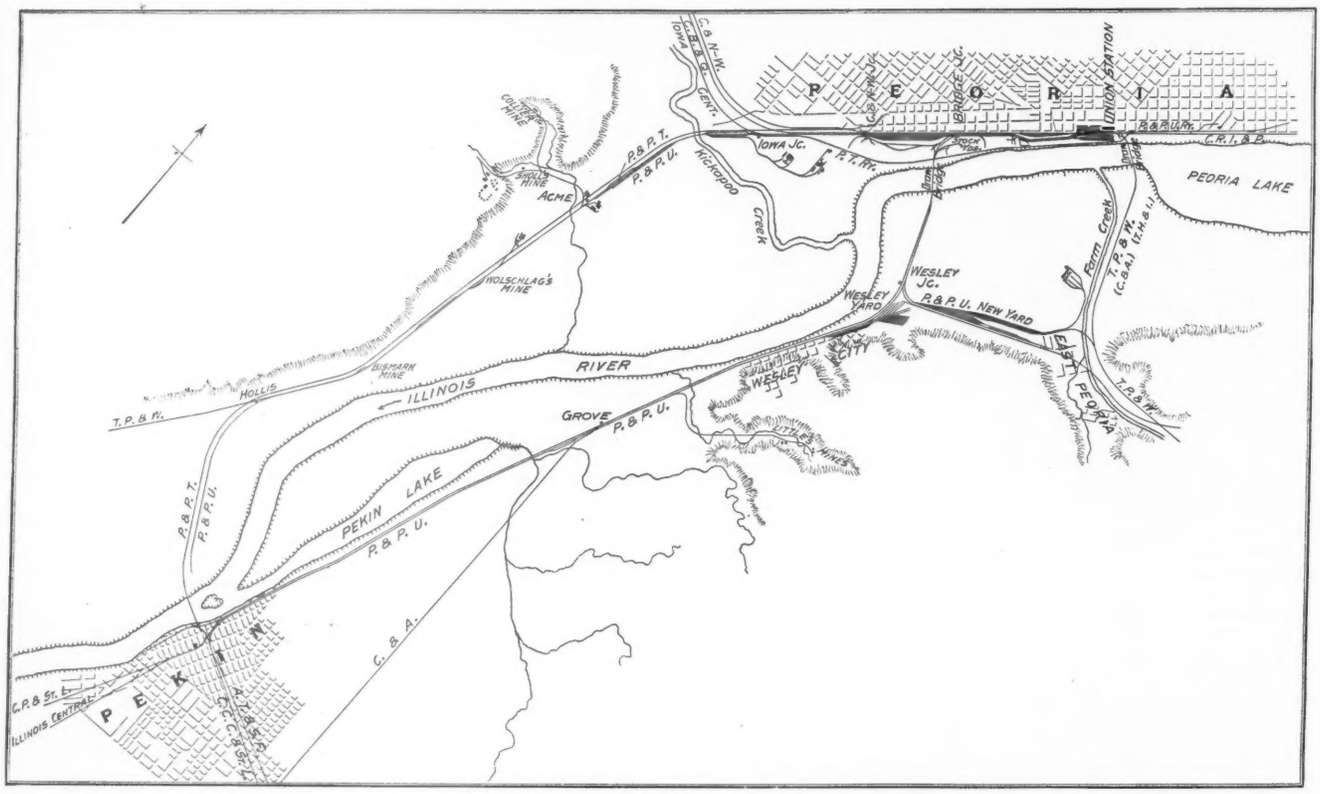
Sec. 38 repeals certain laws.

New Gravity Yard for the Peoria & Pekin Union.

The Peoria & Pekin Union Railway Company, owning a terminal property within and connecting the two cities of Peoria and Pekin, Illinois, is composed of six proprietary interests, namely, the Illinois Central, Chicago, Peoria & St. Louis, Big Four, Toledo, Peoria & Western, Lake Erie & Western and Chicago & North-Western railroads; and of the following tenant interests: Chicago & Alton, Vandalia, Iowa Central, Chicago, Burlington & Quincy and Chicago, Rock Island & Pacific (the two latter for passenger business only).

During the year 1905 there was a total in-and-out movement of cars over these terminals of 570,000, and the total cars handled and switched on orders, including the above, was 1,116,000 for the year. The total days engine service for the year was 8,900, making a total of 125 cars handled per engine per day. The present mileage of the Peoria & Pekin Union Railway is 93 miles, composed of 25 miles of main lines, 9 miles of side tracks on line, and 59 miles of yard tracks. There is a total of 560 switches, four interlocking plants and one drawbridge in connection with all tracks.

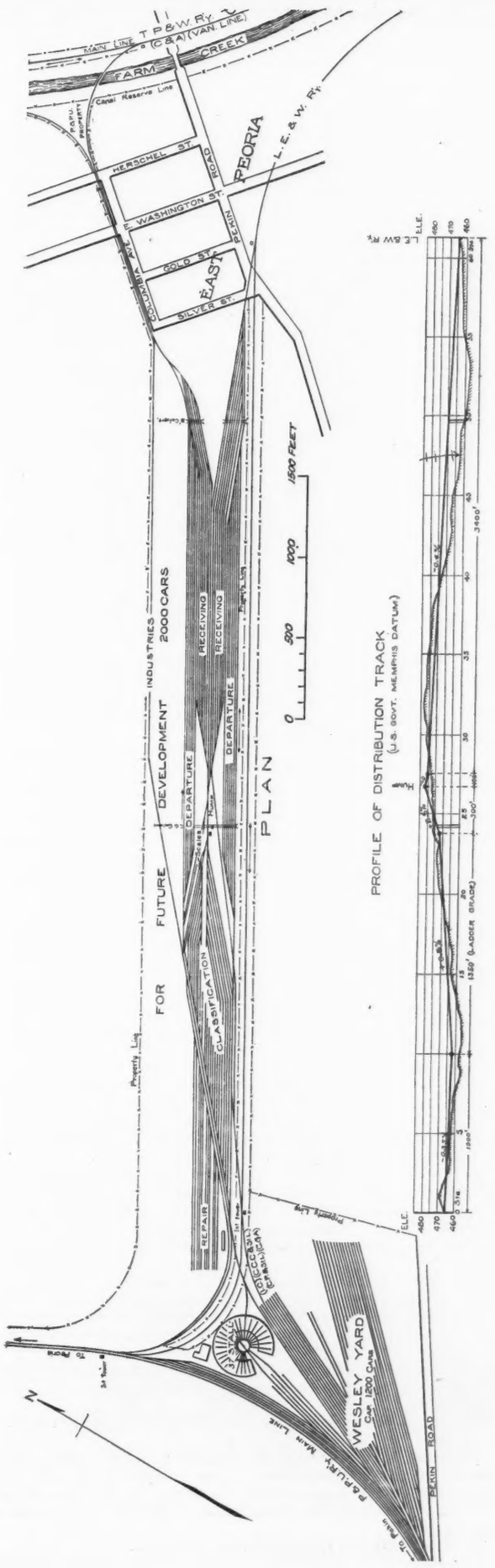
The records show that the business through the Peoria gateway has increased about 8 per cent. each year for past decade and that the present capacity of this property for economical handling of business should not exceed 2,000 cars a day. It therefore became necessary to increase the present capacity enough to take care of the natural increase of business for the next decade. A new yard was accordingly decided on, the plan for which is shown herewith. A map of the company's lines with railroad and industrial connections is also shown. By consulting the latter it will be seen that it is proposed to divert all freight traffic now entering Peoria from the east side of the Illinois river into the new yard, where all trains will be broken up and classified. The interchange of cars between any of the eight roads will be made at this point, and thus only straight Peoria business need be sent into that city.



Map of Peoria & Pekin Union Railway.

The portion of the yards north of the distribution or hump track consists of a receiving yard of six tracks with a capacity of 50 cars each and a departure yard of six tracks with a capacity of 60 cars each. These yards will accommodate the business of the Toledo, Peoria & Western's Eastern division, the Vandalia, and the Dwight division of the Chicago & Alton.

The portion of the yards south of the hump track consists of a receiving yard of seven tracks with a capacity of from 40 to 60 cars each, and a departure yard of seven tracks with a capacity of 50 cars each. These yards will be used to accommodate the business of the Lake Erie & Western from the east and the Chicago, Peoria and St. Louis, Big Four, Illinois Central and Chicago & Alton (Springfield division) from the south. A classification yard of 22 tracks with a capacity of 500 cars, lying immediately west



Plan of New Yard for Peoria & Pekin Union Railway.

or and connected by double ladder with the hump track, will serve to accommodate the classification of both inbound yards. A 150-ton railroad track scale fitted with automatic weighing device is conveniently located on the outside track of the classification yard. All cars to be weighed will pass over the scale, which is built on a 1 per cent. grade, and afterward pulled back on the distribution track and sent over the hump to their proper place in the classification yard. The bad order cars will be dropped into the north side of the classification yard and pushed through into the repair yard, which lies immediately west of the classification yard and is composed of 11 tracks with a total capacity of 200 cars.

The tracks in general are spaced 13 ft. centers with 15 ft. centers on ladders. The repair yard tracks are spaced in pairs of 16 ft. centers and 42 ft. center to center of pairs, thus allowing room for a material or supply track between each pair of working tracks.

The drainage is taken care of with two large concrete culverts of flat top design, the tops being of I beam and concrete construction. The location of the hump is such that it can be raised or lowered as the weather conditions demand.

The engine house and coaling plant shown at the west end of the plan will not be built at present, as the company has abundant facilities for caring for engines on the Peoria side of the Illinois river. The contractors having the work of grading and masonry expect to finish by August 1st and if there is no unforeseen delay in delivery of track material it is expected to have the yard in operation by November 1st.

For the foregoing information we are indebted to Mr. Curtis Millard, President, and Mr. Stanley Millard, Chief Engineer, of the Peoria & Pekin Union Railway.

Leaves from a Railroad Engineer's Note Book.

II.

[Mr. W. W. Hoy, of Johannesburg, South Africa, Chief Traffic Manager of the Central South African Railways, spent about half of the year 1905 inspecting American and European railroads. The appendix to his formal report to his company, consisting of "brief notes on various railway practices," has the freshness and charm which belongs to honest jottings of first impressions, although a trifle more care would have prevented his occasional errors.]

Illinois Central Railroad.

There are at Chicago 10 railroad tracks in actual daily operation, used as follows, and in the order given:

Two tracks—Slow suburban traffic.

Two tracks—Through main line traffic.

Two tracks—Goods traffic.

Two tracks—Express suburban traffic.

Two tracks—Engines working between running shed and station, about two miles.

The main line station at Chicago has no platforms, but has wooden floors raised a few inches above the rail level.

I inquired into the all-electric signal which is in operation here, and found that the motor situated at the points worked very well and gave every satisfaction.

On a line over which this company has running powers, a train on the 19th of May took 1 hour 47 minutes to cover 57 miles.

Each suburban station consists of a high wooden platform, level with the floor of the carriages.

The platform is divided into two sections; one end for express trains, and the other for slow trains.

There is no station master, the station being in the charge of a booking clerk (usually a lady). The average wage paid for booking services is from £7 to £10 per mensem.

The suburban trains are of one class only and are composed of from two to six coaches, six being the maximum. They are worked by small tender engines of four and six wheels coupled type and each carries from three to three and a half tons of coal. These engines are not turned, but run either head or tender first as occasion demands, without reduction of speed. They are not very high wheeled, but are quick starters.

The first carriages provided were furnished with wooden seats, but the later and standard pattern are fitted with cane seats.

The running times were not obtained, but ordinary trains ran eight miles in 28 minutes with 14 stops, and express trains the same distance in 11 minutes.

Smoking and non-smoking compartments are provided.

In trains of two coaches there are two conductors, one of whom acts as guard; in trains of five coaches there are three men provided, one of whom also acts as guard.

The suburban service consists of 243 trains per week-day and 85 on Sundays.

The train brakes are the Westinghouse air type.

In some trains the small space at the rear is utilized for the conveyance of baggage, but baggage is not usually carried, and the space is not specially provided therefor.

Grand Central Station, New York.

The installation in the signal cabins is the low pressure power system. Each pair of points gives an indication when clear. Fly

shunting of trains and carriages is in daily operation at this station.

All passenger carriages are fitted with hand brakes in addition to the provision of the automatic air-brake.

Every train is under the control of the brakesman who regulates the speed either by hand-brake or by the Westinghouse air-brake.

All passenger rolling stock is cleaned at Mott Haven, a depot about six miles from the Grand Central Station.

The signalman indicates electrically to the gatesman the time when to close the gates—just before lowering the starting signal.

New York Interborough Rapid Transit.

The Interborough Rapid Transit (Subway division) is the latest attempt at solving the method of handling congested city and inter-urban passenger traffic.

The subway is 21 miles in length, was built and is owned by the city and has been leased for 50 years to the railway company which works the elevated lines in and about the city.

The principal features of this system are:

1. Underground in the city.
2. Easy access by the public, as the roof of the subway usually forms part of the roadway.
3. The provision of local and express tracks in the center and busiest parts of the city.
4. Uniform fare for whatever distance traveled; tickets being placed in a collecting box before passengers are allowed on the platform.
5. Only one class of carriage.
6. Double tracks throughout with block signal sections so arranged that trains follow one another at intervals of two minutes for local and two and a half minutes for express trains.

One million three hundred thousand passengers are carried daily on the elevated railway and the subway.

The speed averages 30 miles an hour, stoppages included. I traveled on some trains which attained a speed approaching 50 miles an hour between stations, *e.g.*, from City Hall to 96th street, a distance of 6½ miles, was covered in 12 minutes. The average stoppages occupy from 9 to 14 seconds.

The length of rail is 60 ft. and the weight 75 lbs. per yard.

The power is electrically delivered to the train by means of a third rail.

Three-phase alternating current is conveyed from the main power house to sub-stations, where it is transformed into direct current.

Each motor car is fitted with two motors of 200 h.p. each, which are of the direct-current series type. The multiple unit system is in operation on all the trains.

Express trains are composed of five motor cars and three trailers; local trains of three motor cars and two trailers. In the eight-car train the first, third, fifth, sixth and eighth are motor cars.

By the system of motor control the electric power delivered to the various motors throughout the train is simultaneously controlled and regulated by the motorman at the head of each train.

The weight of the motor cars averages 88,000 lbs., and that of the trailers 66,000 lbs. All cars are heated and lighted by electricity. Each car is 51 ft. long, and has accommodation for 52 seated and 100 standing passengers. All stock is of the end door type, and is built to be anti-telescopic and fireproof.

The Westinghouse air-brake system is in use on all trains. An emergency air-brake valve has been provided on the truck of all motor cars; it is operated by a "track trip" which acts in case the motorman does not obey the signal and attempts to enter section which is blocked against him.

The subway is lighted throughout from sources quite independent of the train power supply.

The signals are electrically lighted by a system different to the power and general lighting circuits. An alternating current is employed in the signal track circuit which has characteristic differences from the direct current used to propel the trains.

The gage is standard 4 ft. 8½ in. For purposes of emergency a connection is made with the other railways which run through the city.

Northern Pacific.

On the railroad which runs through the forests alongside the Pacific Coast I noticed that spur sidings had been provided at frequent intervals of one or two miles for the purpose of loading timber. These sidings are only protected by disc signals situated at the points. No fixed signals appear to be in use on the railroads running along this coast. The stoppages on this line at intermediate stations do not usually exceed 15 seconds.

In traveling from Vancouver to San Francisco the time occupied in the journey worked out as follows:

Left 8.45 a.m. from Vancouver, and after 35¼ hours' journey reached San Francisco at 8 p.m.

This time shows at an average speed of 31 miles an hour.

A lunch basket was provided at a cost of 50 cents (2s. 1d.).

The cloak room charges are excessive, 2s. 1d. being charged for five small packages, or a cost of 5d. per package.

The carriages are lighted by electric light, which gives splendid results.

The Pennsylvania and the New York Central.

The two railroads which exert, by their rivalry, the strongest influence upon American railroad working are the Pennsylvania (8,556 miles) and the New York Central & Hudson River (7,703) railroad companies.

Both lines compete for the mineral traffic between the Lakes and the Pittsburg district.

One of the premier trains of America—the "Twentieth Century Limited"—is run by the New York Central between New York and Chicago; the time occupied in the journey being 19 hours. Whilst I was in America the speed of the train was increased to bring the "Flyer" to its destination within 18 hours, because the Pennsylvania Railroad had been enabled, by deviations and regrading in the district of Pittsburg, to shorten its schedule for the same journey to that amount of time. A regrettable accident, however, caused the company to revert to its previous schedule of 19 hours.

As regards the standard equipment of these lines, wherever possible, the tracks are brought up to meet the conditions of running; overhead bridges are being built in the vicinity of cities to eliminate the danger of level crossings—so frequent in American towns; block signaling is also receiving considerable attention, and the Central Railroad of New Jersey (a subsidiary line of the P. R. R.) has recently been installed for a distance of 40 miles with the most modern type of block signals extant.

Additional interest is occasioned in this type of signaling in that the signal lamps are all of the seven-day burning type and require attention but once a week for trimming purposes. Signals are erected at distances varying from a quarter to one mile apart, according to the density of the main line traffic, goods and mineral traffic requiring to be forwarded along the four tracks.

New York affords additional interest on account of the enormous tunneling work which is being carried out by the Pennsylvania.

A two-tunnel, each single track, is being pushed through from Long Island, under the East river, through Manhattan Island, under the Hudson River, and up into the mainland, the state of New Jersey.

In the Pittsburg district this same company has spent over £3,000,000 in effecting improvements, especially with regard to the regrading of the line through the Allegheny Mountains and completing a deviation which entirely avoids Altoona and gives a better grade for express passenger trains.

The Pennsylvania Railroad Company arranges personally-conducted tours in addition to the usual facilities afforded to the tourist agencies.

Rock Island Railways.

A white pole is fixed some distance from a level crossing as an indication to the driver of an approaching train that he is nearing a crossing.

The saloons are fairly well cleaned, but the brass work suffers from want of attention.

Southern Pacific.

This railroad has no fixed signals in general operation. There are, however, disc signals situated at the points, and these are connected with the yellow distant signal, which works in conjunction with the points, showing "clear" when they are set for the main line.

Dining car No. 10,059 running over these lines is the most modern and up-to-date vehicle of its type I have yet seen. It is fitted with ice chambers and a chill chamber, and has very well arranged pantry and kitchen accommodation.

A large proportion of the engines on the Southern Pacific-Californian section are crude petroleum-burning locomotives.

The ferry boats belonging to this company have a carrying capacity equivalent to 48 bogie vehicles and two large locomotives. The boat engines are oil fuel burning, and have only recently been converted from coal consumers. They are, however, very satisfactory. The ferries are fitted with hydraulic lifts for adjusting the gangways at each side, and the locomotives are in motion one minute after arrival of the boat at the pier.

St. Louis Station.

At the station yards 2,500 trucks are handled per day of 24 hours.

The average coal truck carries a 35-ton load.

The system of signaling is electro-pneumatic, and all points operated from the signal towers are equipped with electric repeaters, to indicate that the points have been passed over and are clear.

The movement of all traffic in the yards is controlled from the signal boxes, with which there is telephonic communication from the various yard centers.

The telautograph instrument is operated at this station with great success.

The traffic in the various marshalling yards is broken up by means of "humps" or gravitation sidings. There is one brakeman to each vehicle as it travels down the hump. These men are collected and returned to the hump by a special train consisting of van and engine.

The classification yard consists of 25 tracks.

In loading coal for foreign stations, small carrying capacity

trucks are utilized for stations at comparatively short distances from the loading center, and the large capacity trucks are despatched to New York and other distant stations, the object being to get the greatest available paying haul.

Shunters work 12 hours per day, and are paid at 15 cents per hour. Signalmen in the principal cabins work eight hours per day.

Engines coal at St. Louis in two minutes; the larger engines take about seven tons of coal.

Rest rooms are provided. Engine-drivers have a minimum rest of from four to eight hours, according to the time they have been on duty.

Trains Running on Opposing Lines.

I was considerably impressed by the American method of running trains on opposing lines, *e.g.*, when two trains are running in the same direction, instead of detaining one at a station and allowing the faster train to proceed, arrangements are made for the latter to run on the opposing line of rails, passing the other train en route and getting into its proper position at a station ahead. From the inquiries which I made the system answers satisfactorily. The "Twentieth Century Limited" has actually passed an express train under these conditions, both trains traveling at very high rates of speed.

Railway Oil Contracts.

Whilst in America I took many opportunities of inquiring as to the working of the "oiling" contract system on the railroads and forwarded to the Chief Railway Storekeeper of this administration copies of some agreements entered into in Europe as well as in America.

The motive power officers with whom I discussed the matter speak highly as regards the economical advantages of the system, and although they admit they had considerable difficulty when introducing it, they say that the system is now no longer in the experimental stage, that it is a good one and one which saves the railroad administration money.

Contracts are entered into for periods of three, five and ten years duration.

It does not necessarily follow that the progress of the agreement leads to increased advantages for the oil company, as with the tendency to increase the size of the locomotives and freight rolling stock, the cost of oiling is added to on account of the larger consumption without a correspondingly increased payment being made to the oil company by the railway company.

Invariably also the railroads seek better terms with the termination of their contracts, and my information is that the oil companies have not acted unreasonably in meeting the representations of the railroads. Both parties to the agreement are of course thoroughly acquainted with all the facts.

Probably the best example I can give is the information given me by one of the chief motive power superintendents, who had just taken out some figures in oiling in anticipation of the renewal of the contract coming up for discussion. He informed me that, notwithstanding the increased number of vehicles employed, the larger dimensions of the rolling stock and consequently greater oil consumption per vehicle, the oil cost to his company has only slightly increased during the past 14 years.

I consulted various vice-presidents and general managers with regard to the system under discussion and although I expected considerable difference of view, I was very much impressed by the unanimity of opinion.

I also forwarded to the Chief Railway Storekeeper a list showing the names of the companies who have entered into contracts for the oiling of their rolling stock. It will be observed that in every instance the railroad companies in America pay on a car and engine mile basis, and not per train mile as is contemplated in the copies of contract sent me. the oil company lost on the contract but that compensation was derived from the sale of the oil.

In reporting on this matter I visited some of the oil centers in California for the purpose of studying the method of dealing with oil in bulky quantities and ascertaining what facilities were offered for oil transport.

In some instances the crude oil, utilized as fuel for furnaces and engines, is carried in pipe lines exceeding 110 miles in length from the oil wells to the coast and is run directly to the oil ships or steamers on the wharf or into the oil tanks for conveyance by rail.

The cost of the crude article is from 35 to 40 cents per barrel of 40 gallons, equal to about 1s. 6d. to 1s. 8d. per barrel, or ½d. per gallon.

Canadian Pacific Railway.

I left Montreal at 9.40 a.m. on Sunday and arrived at Vancouver at 12.30 p.m. the following Friday. The distance is 2,942 miles and the speed averaged 21⅛ miles per hour.

The passenger rolling stock in general use is the open sleeping car type, built to accommodate 16 passengers, with one state room which has accommodation for two passengers. Palace cars are now being run, but an extra charge of 36s. per passenger per night in addition to first class fare and sleeping fee is made for what in America is regarded as luxurious traveling.

Tourist or colonist cars have partial sleeping accommodation, bedding being supplied at one-half Pullman rates.

No privately owned Pullman cars are run on this line in general traffic. All cars are owned by the railroad.

Gas is the general illuminant on all cars.

Several passenger carriages are fitted with mosquito netting.

Books, periodicals, newspapers, post cards, illustrated playing cards, postage stamps, telegraph forms, guide books and time-tables, etc., are obtainable on all trains at various centers—one bulletin to each car.

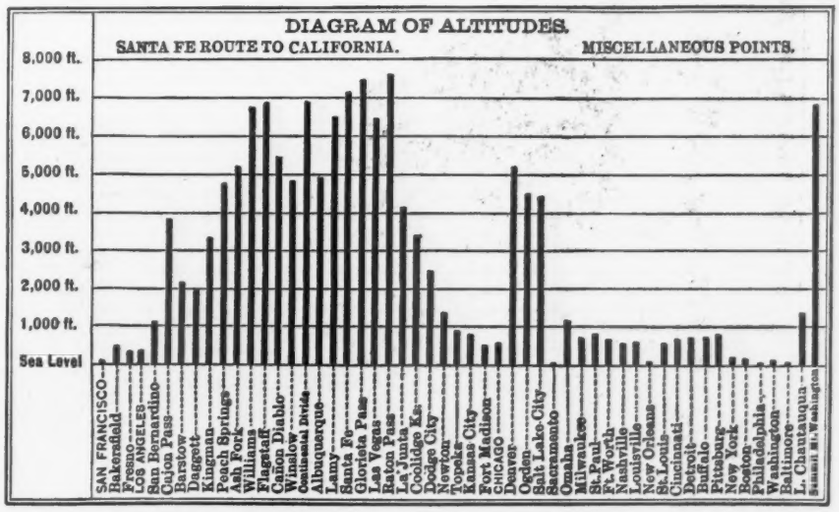
Compressed air is used in the saloons to force the water from tanks to wash basins, no pumping being necessary.

Each car is supplied with hair and clothes brushes.

Iced spring water is supplied for all filters, which are attended to at appointed stations.

Graphics of a Transcontinental Line.

The passenger department of the Atchison, Topeka & Santa Fe has issued a clever folder which shows the altitudes traversed by this route to the coast, and makes capital out of them. Other altitudes are exhibited in comparison, so that we are able to appreciate



Altitudes Chicago to California over the Santa Fe Shown Graphically.

Chicago to California over the Santa Fe Showing Graphically, for Train Leaving Chicago at Night, the Parts of the Road Traversed at Night.

The car mile is considered more equitable than any other form of calculation.

I was informed by one of the motive power superintendents of a railroad operating over 8,000 miles of track that he knew where that the road crosses six Mt. Washingtons between Chicago and the coast, as per the accompanying drawing. The graphic division of the trip into night runs and day runs is another interesting and commendable feature of the folder.

Railroads and Transportation in Siam.

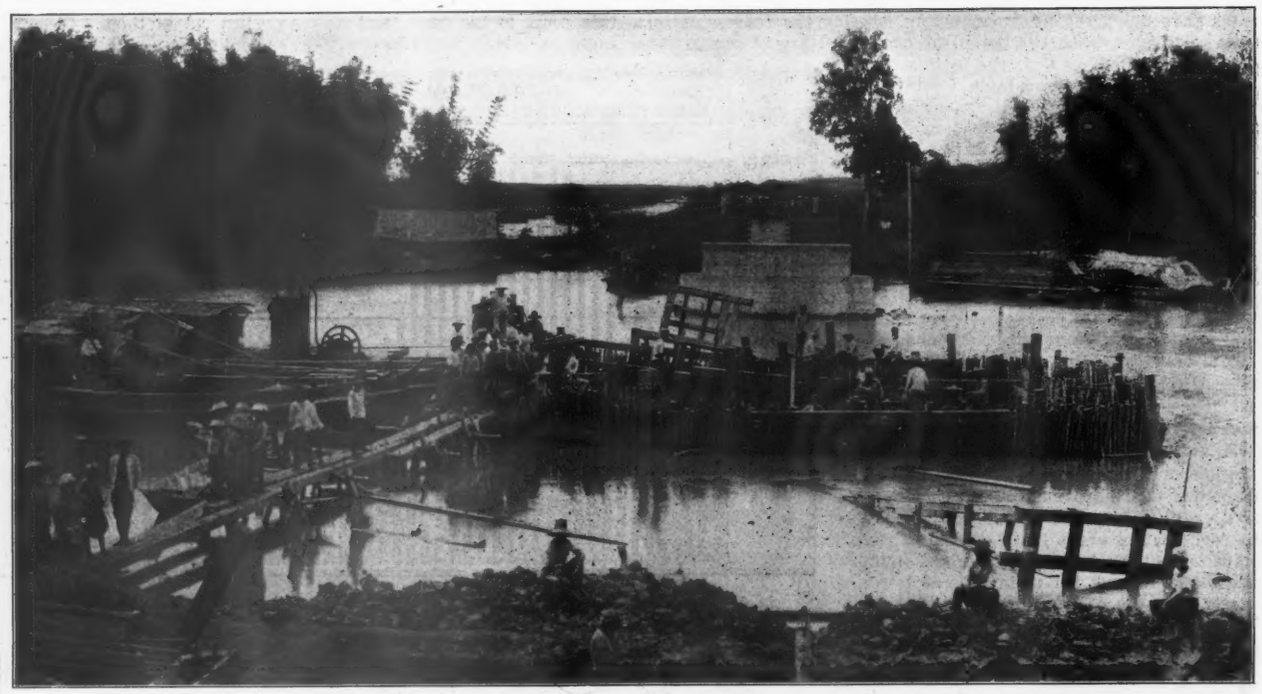
BY L. E. BENNETT.*

In 1891 an association of foreigners living in Bangkok, the capital of Siam, secured a franchise for a narrow gage railroad from Bangkok to Paknam, near the mouth of the Menam river. The length of this line is 16 miles, and the gage, one meter. This was the first Siamese railroad. The ties are of teak wood, worth at present about $1 a cubic foot. They were secured at that time cheaply, as teak is a native wood of Siam. The road was completed in about a year, and has been in operation since the latter part of 1892. It exists for its passenger traffic more than for any other purpose, and has paid interest on the investment from the start. At present the Paknam road pays annual dividends of 12 per cent. on the stock. The line is ballasted with broken bricks and has practically no grades or curves. The distance from Bangkok to Paknam is covered in one hour's run. The road comes in direct competition with water transportation on the river. It gets about all the passenger business but hauls a very small percentage of the freight tonnage, which still goes by water. The Paknam road was built cheaply by using an old roadbed made for carts and vehicles, and cost, fully equipped, only about $19,000 per mile.

Camp of the Construction Engineers.

In 1892 the government advertised for bids for the construction of about 160 miles of standard gage railroad from Bangkok north to the important interior town of Korat, the road to be known as the Korat Railroad. The principal bidders were Mr. George Murray Campbell, a Scotch contractor, who represented a syndicate headed and financed by the great China merchants, Messrs. Jardine, Matheson & Co., of London and China, and Herr Bethge, a German army engineer, who represented a syndicate of Germans backed by the Krupps of Germany. The competition became bitter and from the very first assumed the form of an international fight for commercial supremacy, since, directly behind the two bidders, stood the British and German consuls and all the influence of those two governments, backing the respective claims. The result was that the British drew first blood in a long commercial war, which has not yet ended, and secured the first contract. This contract was to build and equip about 160 miles of line for about $30,000 per mile, a wholly inadequate sum, considering the difficulties and expense of the work and the nature of the country.

The Germans thereupon insisted on the appointment of Herr Bethge as Director-General of the Royal Railroad Department of Siam, and he was appointed by the Siamese king in accordance with the wish of the German consul backed by his government. This appointment placed the Germans in the position of supervising engineers and inspectors over the work to be done by the British contractors. A bitter rivalry already existed between the two before any work was started and the consul for Germany succeeded in inducing the king to believe that it would be a clever move on the Siamese side to appoint German engineers to watch the British contractors in the interest of the government. The results will be foreseen by any practical railroad man in America. A long fight immediately started between the contractors and the Government which lasted for more than six years.



Building the Abutments and Piers of the Ban Po Bridge.

The government railroad department immediately organized a

*Mr. Bennett went to Siam as an engineer engaged in building the Korat Railroad in 1893, and remained with the contractors until 1897. He was later engaged by the Minister of Agriculture to estimate the cost of certain canal and irrigation work, and subsequently negotiated the franchise for a large electric light plant and operated the plant, lighting the streets and buildings of Bangkok, and the King's palace. He was appointed U. S. Vice-Consul-General to Siam in 1899.

force directed by German ex-army engineers who introduced an elaborate organization with so much red tape and pomp and so many high-sounding titles for the officers, that, for a country like Siam, with only 160 miles of railroad under way, the whole thing was like one of Gilbert & Sullivan's comic opera productions. It was very expensive, but it served the real purpose for which it was created by the astute Asiatic government—that is, provided a fine array of uniformed foreign engineers and officials for exhibition on state occasions, which greatly impressed foreign newspaper correspondents and consuls with the large progress which was being made by Siam in civilization and railroad building.

The new Royal Railroad Department proceeded to make things warm for the British contractor who, on his part, was not at all slow to show that he was fully as good a lawyer as a contractor. Much time and money were spent in keeping detailed records of claims against the government, and had legitimate construction work been prosecuted with the same energy and perseverance as records were compiled for claims and arbitration court proceedings, the practical results would have been great speed in actual construction work. The fight went on merrily until the latter part of 1896, when the contract was cancelled and the whole dispute submitted to arbitration, which lasted until 1899, when it was decided in favor of the British contractor and the Siamese government was obliged to pay down a sum equal to about $800,000 and also the cost of the long drawn arbitration proceedings, which was several hundred thousand dollars more. This is the first and last important contract ever awarded by the Siamese government for public work. It caused inestimable injury to every one concerned, and has prejudiced the government against entering into any contracts with foreign firms of contractors for work in Siam.

Building the Pak Preo Bridge, Korat Railroad.

The railroad was completed under the supervision of the government railroad department and the Germans drew second blood in the fight, which has been a very one-sided fight ever since. It has been easy for the Germans to place nearly all orders for railroad materials for Siam in Germany. This victory was promptly followed by the purchase by the large German main lines of nearly all the steamship lines trading into Siam. Thirty or more steamers were bought in two transactions and passed from the British to the German flag. The Germans followed up the two large purchases with several smaller ones of stray British and Danish ships until the whole of the shipping between Singapore and Bangkok, Hongkong and Bangkok, and Singapore and the Philippine Islands is to-day in the hands of the Germans.

Siam has at present over 400 miles of standard and narrow gage single track railroad, and the government builds slowly at the rate of about 30 miles a year of new extension. The work at present consists of an extension of the Korat Railroad north to Chiengmai, in the teak wood country, and northern extremity of the kingdom, where the government has had considerable trouble in the past with tribes called "Hawhs," who speak a dialect of their own, have their own recognized local chiefs, and are little in sympathy with the Siamese government.

The lines now built are:

	Miles.
The Paknam Railroad, narrow gage	16
The Pechaburi Railroad, narrow gage	95
The Korat Railroad, standard gage	160
The Chiengmai branch, standard gage, about	150
The Phrabad Railroad	12
Total	433

The government railroads pay about 3½ per cent. on the investment. They cost about $40,000 per mile to build and equip. In the hands of capable foreign railroad operators, and out of government control, they would easily earn 7 or 8 per cent. The grades are for the most part light and curvature easy. Buildings are of masonry and teak wood—good and substantial construction. The bridges are mostly steel with concrete foundations on piles and brick masonry abutments above ground level. Most of the bricks for the original work were imported from China. There are some teak wood trestles over canals. The rails are of 55-lb. section with hard wood ties 6 x 8 in. The wood is so hard that the ties sink in water, and had all to be cut in the forests, hauled to the rivers and canals by means of water buffaloes, and then floated over to the railroad on bamboo floats. The cost of ties is about 90 cents to $1 each. The track is ballasted with broken bricks in the low country, and stone and gravel in the hill country. Many of the bricks were excavated from the foundations of ancient temples and ruins at the site of the old ruined city of Ayuthia, which was the capital of Siam about 170 years ago before the Siamese were driven out and the ancient city destroyed by the Burmese.

There was a great deal of difficulty experienced in building earth embankments in the low rice country owing to expansion and contraction of the banks. In the wet season the earth and clay soaked with water and expanded. In the dry season the banks shrunk and huge cracks opened up, swallowing large quantities of ballast from the jolting of the trains. In a year or two most of the ballast originally placed under the track had completely disappeared. Likewise the banks settled as much as 30 to 40 per cent. below the established grade, and had to be re-topped. The bridge foundations are what might be called floating foundations, being large at the base and resting on round piles driven from 20 to

Teak Wood Trestle Worth $120 per 1,000 ft. b. m., in the London Market.

Suam Pluk Bridge; Korat Railroad.

30 ft. in the ground, and about 10 to 15 ft. below ground level. The formation in the lowlands is compact silt uniform for hundreds of feet down.

Difficulty was also experienced with bridge foundations and abutments. When the abutments were built and the bank filled in behind, some of the abutments were pushed over several feet by the weight of the earth fill behind. The masonry, piles and all seem to have been sprung forward, moving from the top and apparently in a solid mass, without the slightest injury to the abutment. When the earth was removed from behind the abutments, they sprung back again, in some cases half way to their original position. As the whole of the low lands were subject to flood during the wet season, bricks, ties and other building materials were stored on top of the roadbed during certain seasons.

The embankment was the only dry land within some distance, a fact soon discovered by the snakes and reptiles, which took refuge in the buildings and the track material along the embankment, much to the dismay of the bare footed coolies who worked on the construction. It was necessary to furnish bamboos with hooks on the end so that the coolies could turn over the ties before taking hold of them; and at the bottom of the pile it was not unusual to find several cobras and centipedes.

About 100 miles north of Bangkok the nature of the country changes completely, and the line enters the mountains and jungle. One stretch of some 35 miles of this country was called the "Dong Phya Fai," land of an evil spirit, and was widely known by the natives as an unhealthy locality. Much difficulty was experienced in building this section of the railroad. Deadly malarial fever broke out and many of the white engineers and foremen died or had to be sent out of the country to save their lives. The coolie laborers died by the hundreds, and the balance of them stampeded and ran away. The contractor was obliged to import Chinese direct from China, place them in boats on arrival at Bangkok, and send them up country before they had time to communicate with friends and countrymen ashore, so that they would be ignorant of the bad reputation of the country where they were going to work. They also died like flies and ran away and it was several years before this portion of the railroad was finally built. One German engineer remained through the entire construction. He constantly drank bottled beer, which was enough to kill an average man in that climate. On this he nearly lived, beginning drinking before breakfast in the morning.

The labor used on construction was almost entirely Chinese. They worked by piece work or contract wherever it was possible. A good Chinese coolie would carry in two baskets balanced on a pole on the shoulder nearly 2 cu. ft of earth or clay and dump it into an earth embankment. Good men could carry as much as 5 cubic meters or 6½ cu. yds. per day, at a cost of about 9 cents a cu. yd.

Korat, the terminal point on this line, is a thickly settled district, the gateway to a large population. There exists an ancient silk industry, where the natives have for hundreds of years manufactured beautiful silks on crude hand looms, and in patterns and colors peculiar to the district. The product is very limited, and silks from this place, like fine oriental rugs in Persia, bring large prices.

Although railroads have done much to develop Siam and were necessary in order to reach such places in the interior as Korat, where there is no water communication. I believe the Siamese have overlooked and neglected water transportation facilities. Originally there were no roads in Siam other than waterways. Three large rivers running north and south for a hundred miles or more over a level plain are connected by a network of cross canals intersecting. These have always been the real roadways of Siam, and carry to-day 90 per cent. of the freight of the country. Where the railroads go they readily secure the passenger traffic, but where water transportation is possible, the canals and rivers still compete successfully.

A 20-ton boat starts up country for a cargo of rice, with three boatmen, each drawing $10 wages a month. A whole family lives on the end of the boat, and frequently the wife and children help to propel it. The boat may be operated entirely by a man and his family. Even if all three boatmen are hired at an average wage of $10 a month, the boat can make two trips 100 miles up the river or canal in a month at a cost of $30 for wages, and $10 for repairs and depreciation, bring down 40 tons of rice—20 tons to a trip—and deliver it at the door of the rice mill, which is always located on the water, at a maximum total cost of $1 per ton for the rice delivered at the mill. The railroads cannot do this at a profit, and have the disadvantage of not being able to discharge the rice direct from cars into the mill, which greatly adds to the total cost of transportation. Then, besides, the boatmen can quite likely get two or three tons of general cargo, such as petroleum or cotton goods, on the up-country trip, which pays several dollars for freight, and thus reduces the cost of transportation on the rice. It is safe to say that water transportation on unhulled rice in Siam, where that class of transportation is possible by boat, does not exceed in cost 5 mills per ton mile. Rice constitutes 85 per cent. of the movement of freight in Siam, teak wood about 10 per cent., and the balance of goods transported are included in the other 5 per cent. The export trade of Siam in 1904 amounted to about $22,000,000.

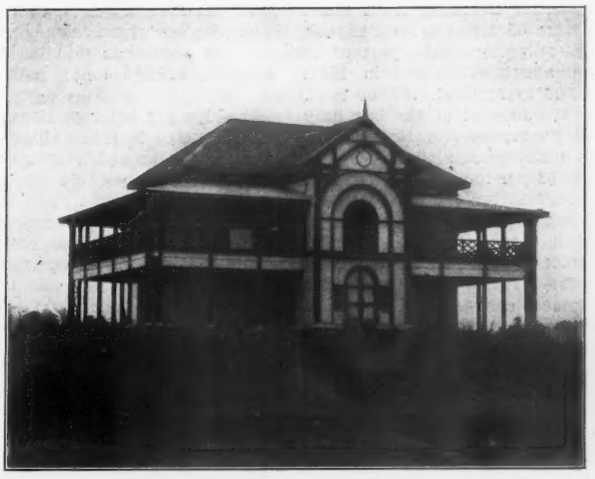
The Siamese have greatly neglected these useful waterways in the past. A German named Mueller secured a franchise some years ago to build a systm of canals and irrigation ditches over an area

Combined Irrigation and Transportation Canal in Siam.

of uncultivated rice land. This land was wild only because of lack of transportation facilities. The canals were completed and the land opened to settlement, with the result that to-day at least 100,000 people live and cultivate the land along this canal where no one lived before, and the main canal is only about 35 miles long. No railroad ever built in Siam up to the present can make such a showing.

The Korat Railroad crosses this canal. The new canal was opened some years ago with considerable ceremony, the king being invited to ride over it. The foreign consuls and many prominent officials were invited to be present. His Majesty traveled up the railroad by special train to the point where it crosses the canal, and arrived about 10 o'clock in the morning on a scorching hot day. This function was a most curious sight. There was not a thing at the landing place but open rice fields, on which the sun beat down mercilessly. At the canal crossing, standing in the open fields under the bleating sun were the German officials of the canal and railroad, dressed in silk hats, spike-tailed dress coats, and tall, white collars, which had long since wilted and collapsed from perspiration. They were awaiting the arrival of His Majesty, who came late, as usual. It is to be hoped that the king enjoyed the sight as much as the spectators. He, himself, had the good taste to wear thin silk clothes suited to the temperature and place.

Materials for railroad construction were formerly purchased by private negotiation, through agents in Germany and England. Some years ago the United States minister, Hon. Hamilton King, began to agitate the purchase of all materials by competitive bid and advertisement in the leading commercial papers of the world. This proposal was opposed by certain officials at first, but not openly, for fear of the imputation of "graft." Finally Mr. King was entirely successful, and to-day all large orders for materials are purchased by advertisement and competitive bids are considered, which gives American manufacturers a chance to compete for Siamese railroad trade.



Station on the Korat Railroad.

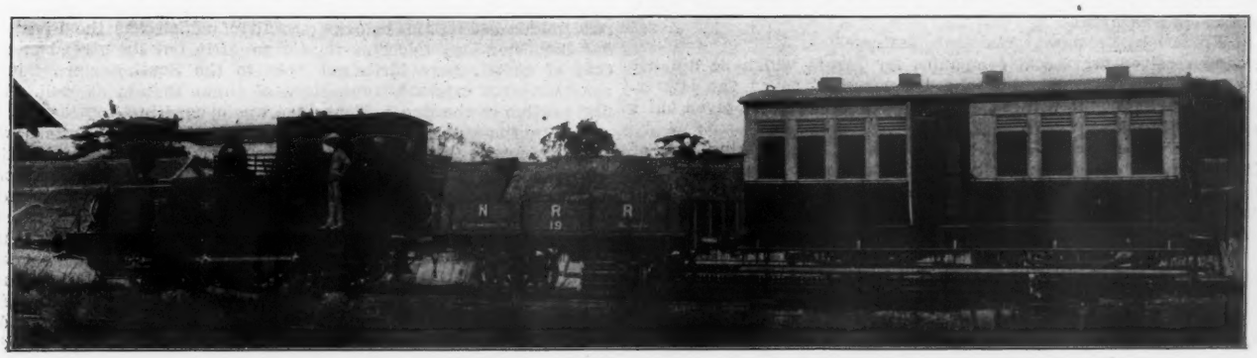
Thus far railroads and all public works have been built out of public revenue, and until a year ago Siam had no public debt. A loan of $5,000,000 was floated for carrying on public works, and was promptly underwritten in London and France on advantageous terms to the Siamese government.

Korat Railroad Passing Through the Jungle.

Rolling stock and equipment of the Siamese railroads include three classes of cars for the passenger traffic. Passenger cars are built after the American type. First class cars are well furnished like a first class day coach in this country, with certain minor changes to suit the altered climatic conditions. Second class cars are somewhat more plainly finished, and third class cars have plain, curved wooden seats and plainly painted interiors, free from any elaborate fittings and finishing. Over 90 per cent. of the passenger traffic is third class. The first and second class do not earn expenses. Passenger fares are about the same as in the United States except first class, which is higher per mile than on the United States railroads.

Freight cars are of the two-axle type commonly used in Europe called "wagons," and carry from 10 to 12½ tons each. The locomotives and cars in use are of many types. Few supplied on the original contract were found suited to the requirements of the traffic which developed.

Bangkok, the principal seaport of Siam, is a large city of mixed population containing about 500,000 inhabitants. It is located on the Meinam river, about 30 miles from the sea. This river is navigable for large ships inside the bar. It is over 600 ft. wide, with a uniform depth of more than 30 ft. at low tide. There is, however, a very bad bar at the mouth of the river, which has only 7 to 10 ft. of water at low tide. This bar is composed entirely of silt and could easily be dredged. The trade of Siam is greatly handicapped by the existence of this obstruction to navigation. At all seasons of the year over half the cargo has to be lightered for over 30 miles from the bar to the city, and during five months of the monsoon, ships are forced



The King's Train.

to anchor 20 miles from the bar, and discharge and load from lighters 55 miles from Bangkok, under the lee of an island. The total shipping of the port of Bangkok per annum is said to have been about as follows in 1904: Exports, 500,000 tons; imports, 200,000 tons; total, 700,000 tons.

On account of the bar only small ships ply between Bangkok and Singapore and Hongkong, where all cargo is transshipped to large European and American steamers. This transshipment costs fully $2 per ton extra freight. Also lighterage on one-half the total tonnage at the Bangkok bar costs another $1.50 per ton. The local ships are only able to cross the bar with something less than half a full cargo. It would therefore appear that the annual cost to Siamese trade on account of the existence of the bar at the mouth of the river is roughly as follows: Extra local freight and transhipment charges at Singapore and Hongkong on about 700,000 tons of cargo per annum at the rate of about $1.50 per ton, $1,050,000; extra cost of lighterage on one-half the total tonnage from the bar and island up to Bangkok at $1.50 per ton on 350,000 tons, $525,000; total cost per annum to Siamese shipping, $1,575,000. If the bar is removed, large ships direct from Europe and America can enter the Bangkok river, discharge and load direct from wharfs, and not charge more than 50 cents per ton extra freight rate from London or New York over the Singapore rate.

The cost of dredging the river bar and building stone jetties to create scour and maintain a depth of 30 ft. of water, might cost $6,000,000; certainly not more. This work would more than pay for itself by indirect returns to Siamese trade in four years. It has always seemed strange that the British government and shipping interests do not take up this matter and push the dredging of the bar. In this way British shipping interests could recoup their lost prestige and shipping trade at one stroke, as this would place them in the position of being able to enter the Bangkok trade with their large steamers from Europe, and compete on equal terms with the German steamers, and would, to a great extent, make the local German steamers unprofitable investments so far as the Bangkok shipping trade is concerned.

Railroad Officers' Stock in Coal Companies.

The investigation of the relations of the Pennsylvania Railroad and its officers to the companies shipping coal over its lines, which is being made by the Interstate Commerce Commission, was reported in part in our issue of May 25, page 527. The hearing was resumed the following week, and the first witness was W. A. Patton, Assistant to the President of the Pennsylvania. He presented a list of the companies in which he held stock, prominent among which were the Keystone Coal Company and the Atlantic Crushed Coke Company. Some of his stocks were acquired as a result of his participation in a company which bought the coal lands when the business was started. Replying to a question as to how he acquired large amounts of stock in certain companies, Mr. Patton said that he was born in western Pennsylvania, and had been a life-long friend of Colonel Huff, who had given him the stocks. Friendship, said Mr. Patton, goes a good ways. "These stocks were not given to me for favors that I might be able to render. The railroad company encouraged the development of the soft coal lands and at that time it was not considered a crime for a railroad man to hold stock in a coal company." Mr. Patton had never attempted to conceal his ownership of coal stocks and did not believe that his superior officers were ignorant of such ownership.

A. W. Gibbs, General Superintendent of Motive Power, said that he owned no stock and was in no way interested in any coal company.

Witnesses testifying in behalf of the Alexandria Coal Company asserted that the Alexandria mine had to be sold because of inability to get sufficient cars, and that other coal companies at the same time were receiving cars. One witness asserted that Michael Trump, General Superintendent of Transportation of the Pennsylvania, had said that the road intended to protect the Berwind-White Coal Company at all hazards.

Frederick Vrooman, Assistant Trainmaster, told of gifts of money received from coal companies for favors which he did not grant. "Then why did you take the money?" asked the lawyer. "Well," answered the witness, "if there was money to be given out I was there to take it."

The First National Bank at Altoona and the banking firm of Cassatt & Co., of the same city, are largely owned by relatives of the President of the Pennsylvania road, and inquiry was made to find out if President Cassatt had any interest in the coal business, but none was shown.

The Altoona Coal & Coke Company, hauling cars from the mine to the main track with its own engine, was allowed 18 cents a ton out of the rate ($1.30) to tidewater.

J. B. Hutchinson, former General Manager of the road, gave testimony concerning distribution of cars at times of great scarcity. Some shippers asked for more cars than they required, and then allowed them to stand loaded on the sidetrack.

J. Howard Patton, of Greensburg, Pa., brother of W. A. Patton, is Superintendent of the Claridge mine of the Keystone Coal & Coke Company, and is also station agent at Claridge, but without salary. Asked why he continued as agent without remuneration, he said because he belonged to the Veterans' Association of the Pittsburg division. He thought that his brother's connection with the railroad and the coal companies rather worked to the disadvantage of the coal companies.

Victor Wierman, Superintendent of the Pennsylvania at Camden, N. J., testified concerning privileges allowed to the Susquehanna Coal Company at South Amboy, N. J., and concerning stock in the Saltsburg Coal Company owned by him. He had bought this stock when assistant engineer on the Pittsburg division.

J. K. Johnston, Superintendent at Tyrone, testified that he owned no coal stocks. He had repeatedly been offered gifts by or in behalf of shippers, but always declined to receive them.

Albert Von Bergelberg, of the Reakirk Brothers Soft Coal Company, averred that the railroad had ruined him financially; he believed that they refused to give him cars because they held no stock in his company. The witness testified as to hundreds of letters written to the general manager and other officials urging them to allow him more cars. He said he had been forced out of the South Amboy trade by the Keystone Coal & Coke Co. The discriminations against him compelled him to run behind in expenses for the past two years.

R. H. Large, coal freight agent of the railroad, gave evidence showing that it was impossible for shippers other than the Berwind-White Coal Co. to send coal to Harsimus (Jersey City). Mr. Large also testified as to allowances made to several of the Lloyd companies on rates to tidewater points, and allowances made to the Latrobe Coal Co. for carrying coal from the mines to the main line of the Pennsylvania, while, as a matter of fact, the hauling was done by the railroad, as the Latrobe Co. at that time had no engines. There was a special allowance made to the Susquehanna Coal Co. which supplied bunker coal to the tugboats in New York. The Susquehanna enjoyed a monopoly on this class of business.

On May 23 the Board of Directors of the Pennsylvania Railroad appointed a committee of five directors to investigate the charges of wrong doing which have been brought against officers of the company during the hearing. The chairman of this committee is C. Stuart Patterson. The committee has engaged as special counsel Mr. Silas W. Pettit.

President Cassatt, who went to Europe about three weeks ago, has telegraphed that he is coming home at once, expecting to reach New York June 2.

The newspapers say that suits have been brought in the courts against the Pennsylvania Railroad on charges of discrimination in the distribution of cars by the Pennsylvania Coal & Coke Company for $2,500,000, and the Federal Coal Company, for $750,000; also that many other shippers will bring similar suits.

Seventieth Anniversary of an English Railroad.

BY W. B. PALEY.

The South-Eastern is now, with the exception of the Great Western, the only important railroad entering London that was authorized so long ago as the reign of King William IV., yet still exists under its original title. The South-Eastern Railway was incorporated in 1836. Several other metropolitan lines, some of greater importance, date from that period, but have changed their names. To some extent the identity of the South-Eastern has been lost since the working agreement formed in 1899 with the London, Chatham & Dover, but nevertheless each company retains its separate capital account and its own board of directors.

It will easily be recognized that so profitable a location as one to Dover, the key to the traffic to and from mid-Europe, would not be long in attracting the attention of capitalists when once railroads became a popular form of investment. The project was really mooted so long ago as the end of 1824, a period when a small railroad mania set in, the principal result of which was the Liverpool & Manchester line. Nothing then came of it, but the second mania, that of 1833-7, gave birth not only to the South-Eastern but to nearly all the original trunk lines of Great Britain as well. The first portion of the line to Tonbridge was opened in May, 1842.

As authorized by act of June 21, 1836, the South-Eastern was to commence at Croydon, some 10 miles from London, by a junction with the London & Croydon Railway near its terminus. This local line had received its charter the year before. The South-Eastern would have preferred to be independent of it, but the Government did not favor an additional cutting and carving of the crowded parts of South London, and as the Croydon company itself only got into London over the Greenwich line it was considered that the South-Eastern was not unfairly dealt with on similar terms. No running powers, however, were provided, nor authority to have a London station, either where these other lines terminated, near London Bridge, or elsewhere. The route to Dover was to be via Oxted, Edenbridge, Tonbridge, Ashford and Folkestone, the first portion

involving very long tunneling near Oxted. Work was begun on this section, but had not proceeded far when, in 1837, the London & Brighton Railway obtained a charter. This line also was compelled to make use of the little Croydon company's undertaking. As it would go for some miles to a certain extent in the direction of Dover, it was thought better to save the tunneling and use the Brighton line as far as Red Hill, near Reigate, about 21 miles from London. A short bit from there to Edenbridge brought the South-Eastern back to its original plan, as far as the line farther east was concerned, but at the expense of seven miles extra distance. Within recent years, however, the Oxted line has been built, although it is not used for London-Dover traffic, a still shorter cut having been previously opened. To prevent any more loss of distance, the South-Eastern Railway was laid out as straight as the crow flies between the Brighton junction at Red Hill and the town of Ashford, in Kent. This stretch of 45 miles is probably the longest straight piece of railroad in the Kingdom. As it goes through favorable country, if the South-Eastern in old days had been an enterprising company it might have made a great reputation on it for high speed.

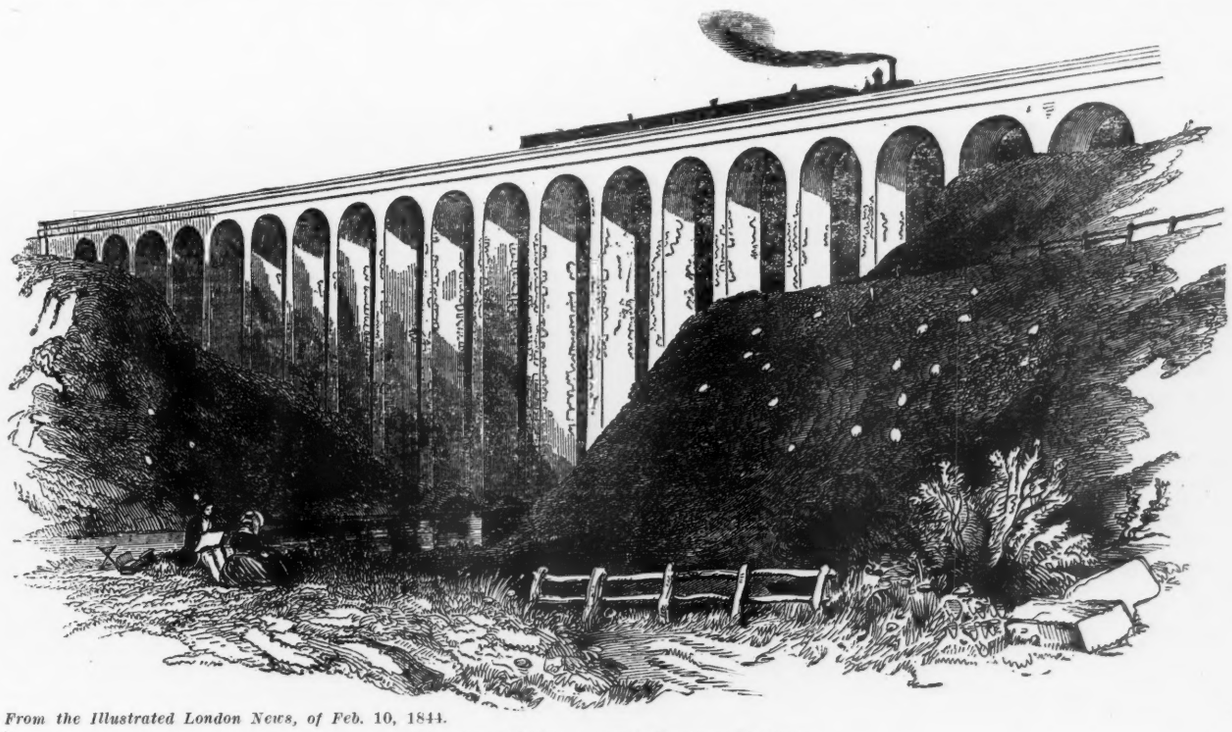
The Brighton Company got to work in 1841, but it was May of the following year before the first section of the South-Eastern, between Red Hill—or Reigate, as it was called—was opened for traffic. Headcorn was reached in August, Ashford in December, and by June, 1843, the road was open to Folkestone. This, of course, was almost as good a point for Continental traffic as Dover, and soon proved that this branch of business would be extremely profitable. Before long the harbor was acquired from commissioners, and a short but very steep branch railroad made down to it, crossing the harbor by a turning bridge built of laminated wooden planks in the form of a double bow. This bridge, built about 1848, is still in use, and is decidedly a curiosity.

So far as Folkestone the construction of the line was easy enough. The Folkestone station, however, is approached by one of the highest viaducts in the country. This crosses the valley of the Foord, a small stream which comes down through a deep gully in the chalk. There are 19 arches, all of 30 ft. span and only 6 ft. thick, built in brick. At the highest point the rails are 105 ft. above the usual level of the stream. The central piers have inverted arches below them. All have stood extremely well, the structure being to-day in excellent order. The total length of the parapets is 758 ft. It was considered a marvel of lightness and compactness, from the fact that the pressure of the entire structure was not more than 1,200 lbs. to the square foot. The Folkestone viaduct is shown in the accompanying illustration, which is taken from a wood cut in the *Illustrated London News* of February 10, 1844, and is therefore contemporaneous with the opening throughout of the South-Eastern line.

The remaining six miles into Dover comprised works of a magnitude hitherto unknown. High chalk downs, rising to 350 or 400 ft. above the sea, extend to the water's edge; the coast line being, however, somewhat indented. Three tunnels, respectively 1,590, 5,799 and 4,176 ft. long, were built, named Martello, Abbot's Cliff and Shakespeare tunnels. In the two last, owing to the great depth below the surface, horizontal shafts were used, opening on to the sea, in addition to the usual vertical ones. The excavated material was simply tipped out and the galleries were closed up again, leaving the shafts open for ventilation. In the Shakespeare tunnel the chalk was so friable that two separate tunnels were made, each about 30 ft. high by 12 ft. wide, with a mass of chalk 10 ft. thick between them. It was intended to leave these tunnels unlined, but afterwards they had to be lined, an inconvenience considerably felt with modern rolling stock of maximum dimensions. Between Abbot's Cliff and Shakespeare tunnels a way was made by blasting down the side of the cliffs and building the line on the debris, a strong sea wall keeping this from being washed away for about a mile. This sea wall is 23 ft. thick at the base, 5½ ft. at the top, and about 60 ft. high. On this section was Round Down cliff, 375 ft. high, which was entirely removed on January 26, 1843, by the explosion of 18,000 lbs. of gunpowder.

From Shakespeare's Cliff tunnel to the Dover terminus (a site for which was obtained with difficulty) the line ran, and still runs, upon a wooden viaduct. At high tide, in rough weather, the sea drives up under the line. To prevent the shingle from being washed away a number of old Great Eastern Railway tenders were obtained from the Stratford works, filled up solid with concrete and pitched about on the beach. The timber viaduct or trestle had a counterpart at the London end at one time, though it has long been replaced with earth work. London Bridge station being, in spite of enlargements, too small for four companies, an obnoxious toll having to be paid to the Greenwich Railway for the use of 1¾ miles of that line, the South-Eastern and Croydon companies opened, on May 1, 1844, a large terminus in the Old Kent Road, termed Bricklayer's Arms, from a neighboring inn. This was used as a supplementary passenger station, third-class traffic being dealt with there. For upwards of 40 years it has been the chief London freight and cattle station. On the Bricklayer's Arms branch was a trestle or wooden viaduct about a mile long, described as "built in the American manner, in which a certain rude elegance is attained at small cost." The wood was subjected to Payne's anti-dry-rot process, which was also supposed to render it fireproof.

The South-Eastern was a badly planned line. It not only took a course about 20 per cent. too long, but one which avoided all the important places in Kent. Its length from London Bridge to Dover was 88 miles. A direct line through Maidstone, the county town, need not have been more than 70 miles. However, in those early days everyone was not convinced of the need for railroads, and Maidstone would not have one. The route by Chatham and Canterbury was the proper one, and might have been got into 73 or 74 miles, but the passage of the river Medway and the heavy gradients



From the Illustrated London News, of Feb. 10, 1844.

Folkestone Viaduct; South-Eastern Railway.

beyond were thought too formidable. Early in the sixties the London, Chatham & Dover company built its line this way, and proved a thorn in the South-Eastern's side for many a year. Its coming rendered cutting off the right angle at Red Hill indispensable, and in 1868 a shorter route was opened between Tonbridge and New Cross, saving some 12 miles, though at the cost of heavy gradients. The extensions, in 1864-66, from London Bridge to Cannon street and Charing Cross were also undertaken with a view to meeting the new competition, now happily ended by a working agreement under the style of the South-Eastern & Chatham Railway.

The Dover line was originally laid with triangular sleepers, two being cut from a square balk. It was expected that they would bed themselves better in the very poor ballast the district affords. It was not a costly line, all things considered, the 67 miles from Red Hill to Dover being made for $14,250,000, or about $212,500 a mile. The railroad was opened throughout on February 7, 1844, and has paid an average dividend upon its ordinary stock of 4.29 per cent. a year for the 62 years.

The Gasolene Car for Interurban Service.*

In view of the present widespread interest in steam railroad circles in the self-power-contained car as a means of meeting the increasingly severe competition of the electric roads, it may not be amiss to consider this type of car from the viewpoint of the electric railway engineer. That the large roads have keenly felt this competition has long been known, and it is now particularly evidenced by the various methods under consideration for meeting it. Thus, the Union Pacific has built at its Omaha shops a straight gasolene car, wherein the power output of a gasolene engine is mechanically transmitted to the car wheels. The Burlington some months ago built at its Aurora shops and for a short time experimentally operated a gasolene-electric car, wherein the power output of the gasolene engine was transmitted electrically to the wheels. The Delaware & Hudson has placed in operation a gasolene-electric car. The Lake Shore is also trying such a type of car. The Ohio River & Columbus Railway, according to the technical press, is experimenting with a steam propelled car which is to be a modern edition of the old-time steam "dummy." The press very recently described the Strang car, a gasolene-electric car which ran with its own power from Philadelphia, where it was built, to Kansas City, where it is to go into service on an interurban road in that vicinity.

The writer has seen experimental outfits utilizing the automobile principle of carrying the motive power on the truck frame. In one case, it was a high-pressure superheated steam engine with direct chain transmission and with flash boiler, kerosene or gasolene-pan burner, radiating condenser, etc., all very much the same as the equipment of the well-known "White" steam automobile. In another case it was a four-cylinder gasolene engine with friction disc transmission, etc., similar to automobile equipment.

The independent motor car idea had its inception abroad and much more work has been done in this direction in France, Germany and Great Britain than in this country. The most conspicuous application of the idea is the steam motor cars of the Great Western Railway of Great Britain. This railway has in use a number of modernized steam dummy cars using coal as fuel for steam generation. The preference on the Continent seems to be for the internal combustion engine and several experimental gasolene engine cars are being tried. The Wurtemburg street railway is one of the most aggressive of foreign roads in trying the independent motor car. This railway has experimented with electric storage battery cars, with steam motor cars of the Serpollet type, and gasolene cars of the Daimler motor type. It is interesting to note that the Wurtemburg street railway put an independent gasolene motor car into service in December, 1893, something over 12 years ago.

There can be no doubt that most of the several types of self-power-contained cars will find useful fields of application and will become valuable auxiliaries to the standard forms of rail transportation; but also, in the judgment of the writer, there should be no doubt that these fields of application will be relatively restricted and do not include such as are now served by the standard electric system.

The factors which have made electric traction so brilliantly successful in city, urban and interurban service are many and varied, but those which enter into a discussion involving a consideration of other types of motor cars are: (a) reliability and simplicity; (b) high schedule speeds and high train frequency; (c) cleanly and noiseless operation; (d) low cost of operation and of maintenance.

On the other hand, the self-powered cars enjoy two advantages which are the sole reasons for the present interest in this type of car. They are: (e) absence of external power transmission circuits; (f) lesser initial investments.

*Extracts from a paper by F. W. Hild, Chief Engineer of the South-Western Wisconsin Railway, read at the third annual convention of the Iowa Street and Interurban Railway Association, held at Des Moines, April 19 and 20.

Descriptive.—The straight electric system has been in use some 17 to 18 years, and its essential features of power station, substation, transmission line, overhead or third-rail conductor, track return circuit, trolley and car equipments, are well understood by all railway men. The several types of independent power-contained cars have been described at different times in the technical press. Nevertheless, a few notes descriptive of one of the earliest cars in successful operation in this country at the present time may be apropos, particularly since all this new type of cars have many things in common. [This is the St. Joseph Valley Traction Co. car described in the *Railroad Gazette* April 21, 1905.—Editor.] . . .

The entire space inside and under the car body is so completely taken up with the power equipment as to leave no room for passengers or merchandise, whence it follows that this car is a locomotive pure and simple, and is of use only with trailers. Its weight is approximately 37 tons, distributed about as follows:

Car body and trucks	15 tons.
Gasolene engine and generator	9 "
Storage battery	5 "
Motor equipment	5 "
Water-cooling system, gasolene tank, air-brake equipment and other accessories.	3 "

All the apparatus in the equipment of this locomotive has demonstrated its utility in various fields of application, practically all of the electrical apparatus being standard for railway service, so it may well be said that there is nothing experimental about the outfit. In view of the highly developed standard steam locomotive, it is extremely doubtful, unless the fuel cost of gasolene engines be enormously reduced, that such locomotives as just described will become popular. It is proper to say here that the St. Joseph Valley locomotive, which in itself is a very successful machine, is the outcome of exigencies arising from certain franchise restrictions affecting motive power and time when the road had to be put in operation. The later equipment and the other self-contained cars in construction or in operation in all cases combine the motive power with the passenger or freight car on the same set of trucks.

Apparently the greatest difficulty encountered by the designers of the gasolene cars is the transmission of power from the engine to the driving wheels. This is not surprising in view of the fact that the internal combustion engine is essentially a constant-speed motor and that railway work demands wide ranges of variable speeds. At the present time the favorite means appears to be the use of electricity, indicating that the difficulties of direct mechanical transmission and variable speed operation are so great as to warrant the rather roundabout transmission involved by the addition of a generator, with or without batteries, and the standard railway type motors and control. Indeed, it is claimed by the promoters that the efficiency of the gasolene-electric outfits compares very favorably with any type of mechanical transmission, and, moreover, has the greater advantage of large variations of speed, flexible driving, ease of control and lesser wear and tear. The acceleration and changes of speed are smooth, and without the jar or shock which is ever present with any mechanical change-speed gear. This situation suggests to electrical engineers the early discussions of series vs. shunt motors for railway work. The designers of the gasolene-electric cars, while fully agreed as to the method of power application, nevertheless differ among themselves on the important question of power supply. Thus some insist that a storage battery is an indispensable adjunct, for the reason that gasolene engines have low efficiencies at fractional loads, and furthermore have practically no overload margin; the battery, therefore, is needed to take care of the recurring inevitable over-loads. Others, however, prefer to use a much larger generating unit, largely because of the saving in weight and space, and the avoidance of acids and fumes.

General Comparison.—It probably needs no argument to show that the straight electric car considered alone is far less complicated and hence far more reliable than any other form of motor car. The straight electric has the minimum of moving parts, all of which (excepting the brake mechanism, which is common to all cars) are non-reciprocating, while all other types of self-propelled cars have reciprocating mechanisms, which include a great number of moving parts, more or less complicated in adjustment. The greater simplicity and reliability of the standard electric car is perfectly obvious in the fact that, aside from the conductor or fare collector, but one attendant, the motorman, is necessary for the car operation, whereas, every type of independent railway motor car, so far as the writer knows, requires an additional skilled mechanic to look after the portable power plant. Of course, efforts are and will be made to render the equipment so thoroughly automatic as to permit of dispensing with this skilled mechanic. Far be it from the writer's wish to infer that American inventive ingenuity may not accomplish this, but a few healthy doubts as to its early attainment are permissible when one remembers the automobile enthusiast who stated that he owned a car for three years, of which he spent one year on it and the other two under it. The annoyances which may attend the use of a private vehicle may be tolerated by the owner, but such annoyances would be prohibitive in a public utility like a transportation system; therefore the need

of minimizing interruptions and delays will undoubtedly compel the retention of the extra attendant.

But the question of reliability of the straight-electric goes beyond the car itself and involves a consideration of power generation and transmission. Power generating machinery, both steam and electric, has been brought to a very high order of development, and in the hands of thoroughly competent operators the probability of interruption of power service through failure of this machinery is extremely remote, particularly if the plant be provided with a judicious yet reasonable reserve. There are plants in this country which have operated for years without failing to deliver power, and it has come to be understood that the engineer who fails to "keep the busses hot" must have an exceptionally good excuse in order to retain his job. . . .

Schedule Speeds and Train Frequency.—It is a peculiar fact that no other form of machinery, whether used for power generation, power translation, or power utilization has such high efficiency, such capacity for overload and such flexibility of control as has electrical apparatus. The remarkable speed and torque characteristics of the series-wound motor permit of a smooth and rapid rate of acceleration, absolutely under the control of the operator. This rate of acceleration may be practically anything desired and is accomplished without resorting to excessive power demand or abnormally large motors. The maximum acceleration is usually determined by the comfort of the passengers, and by the slipping of the wheels, and is not limited by energy consumption. Indeed, it has been shown that for a given schedule the equipment having the highest rate of acceleration will perform the service with the least energy consumption. The facility for maximum acceleration, the great capacity for overload, and the high ratio of power to weight, enable the straight electric car to handle more successfully and economically high or schedule speeds than any other type of car, no matter how equipped. The steam-engine operated car, because of the overload power of the steam engine, would probably come next, while the gasolene car, with direct mechanical transmission, would, because of the absence of starting torque and of overload capacity of the gasolene engine, fall well below them all.

High accelerating power becomes more important as the number of stops in a given distance increases, and it is this fact, as well as the difficulty of mechanically transmitting power from the gasolene engine to the drivers, which renders combination gasolene electric cars at present the most promising of the self-contained cars.

That system of transportation operating the most frequent trains will obviously best serve the traveling public. The experience with the standard electric cars has demonstrated the public's appreciation of this in the new business which the electrics have built up for themselves. Such frequent train service of the standard electric system is made possible by the fact that practically no power is wasted. The motorman by the simple manipulation of his controller utilizes the power only as it is needed, and does not waste energy—that is, fuel—when the train is coasting or standing still. Experience of electric roads is such that the starting and stopping of the different train units so dovetail into one another that the load on the central power house is proportional to the *average* energy consumption per train.

Any system of transportation employing self-contained motive power units must be obviously at a disadvantage in this respect, since fuel consumption must go on all the time the train is in service, whether it is coasting or standing at a station.

Operating and Maintenance Costs.—The absence of actual operating data of self-contained cars does not permit at the present time of a comparison of actual maintenance and operating charges between such cars and the straight electric. It is perfectly logical, however, to expect, in view of the complicated mechanism of the former and extreme simplicity of the latter, that the maintenance charges for the self-contained car system will be greater than for the straight electric. The maintenance cost may reasonably be expected to be about midway between the electric car and the steam locomotive.

The operating cost of the several types of self-contained cars will naturally vary among themselves, but in all instances such costs, exclusive of interest on the investments, will be materially higher than the straight electric, and in most cases the costs, including interest charges, will favor the straight electric. This reasonably follows in view of the high efficiency of the modern power station and transmission systems of electric traction, and also because of the high weight efficiency of electric cars. The independent motor car must not only drag along its own power plant but it must sacrifice valuable remunerative space in order to carry it. For the same remunerative capacity, the self-contained car will weigh from 50 to 100 per cent. more than the standard electric car. Under the same conditions of track, speed and distance the energy consumption required to move cars of any sort will vary as their weight, whence it follows that the energy consumption of the self-contained car will be from 50 to 100 per cent. greater than the electric car.

The labor expense of practically all types of self-contained cars will be 50 per cent. and upwards—greater than the straight electric for the reason that in addition to motorman and the conductor, a skilled mechanic is necessary for the operation of the power generating apparatus in each of the self-contained cars. This attendant is usually paid 30 to 40 cents per hour, or from 50 to 100 per cent. higher wages than the ordinary platform man receives.

All self-contained cars, excepting those equipped with storage batteries, must have prime movers of sufficient capacity to suitably accelerate the cars, and since the power required for accelerating is from two to four times that for full-speed running and also because of the intermittent power demand in railroad service, it follows that the average load on the prime mover will be but a fraction of its rated power, hence the efficiency of engine operation whether steam or gasolene, must be low. This condition is worse with gasolene engines, which have no overload margin, and in many cases the average load will probably not exceed 40 per cent. Where a floating storage battery is carried on the car, it is, of course, possible to use a smaller engine and to work it at close to its rating most of the time, and the fuel cost per ton-mile of such a car would be somewhat less than of one without battery.

The St. Joseph Valley locomotives with single trailer, during the early days of its operation averaging 66 miles per day, consumed 50 gals. of gasolene per day. This worked out per train mile as follows:

Fuel, at 16 cts. per gal	12.0 cts.
Labor, 75 cts. per hour	3.4 "
Acid, water, waste, sundries	0.6 "
	16.0 cts.

Mr. H. M. Beardsley published in the *Street Railway Journal*, July 15, 1905, a very complete table of operating statistics of electric roads in New York state. A study of this shows that straight electric operation per car-mile is much less than the above figures, and if the comparison be made on the basis of cost per car seat or unit of remunerative space the showing will be still more in favor of the straight electric cars. The averages of ten roads in the table work out as follows:

Operation.	
Power	2.629 cts.
Wages of conductor, motorman	4.146 "
Car service supplies	.109 "
Miscellaneous	.16 "
	7.044 cts.

Comparison between a single concrete case and an average of a lot of widely varying cases, while giving an indication, is not convincing, therefore it may be of more interest to compare briefly the requirements and performance of a gasolene-electric car and a straight electric car for transporting a given number of passengers, under the same conditions of distance, time, stops and roadway. Assume a line 25 miles long, standard steam railroad construction, stops of 15 seconds duration each, to average one every three miles. It is desired to operate a car seating 48 passengers, making the run one way in one hour.

Let us take the Delaware & Hudson car previously mentioned. [*Railroad Gazette*, Feb. 9.] It has been recently described in the technical press but nothing regarding its detailed performance published, so we must rely upon calculated performance. This car weighs about 125,000 lbs. and the car body, 65 ft. over all, is of the combination type; that is, with passenger and smoker compartments seating a total of 40 passengers, and with baggage-express compartment. The engine is at one end, and the motorman's compartments with controlling apparatus at each end for operation of the car in both directions. Power is supplied by a 160 h.p. gasolene engine, direct-connected to a 120-k.w. separately excited generator. A small 5 k.w. generator furnishes the excitation. Motor equipment consists of two 200 h.p. standard railway motors, with two series-parallel controllers. The generator output is limited by the capacity of the gasolene engine. The controllers, besides the usual connections for changing motors from series to parallel, also have connections for changing the voltage of the generator through its excitation. The acceleration and speed regulation of the car is then governed by the voltage of the generator and not by the usual method of resistance in series with the motors.

A standard interurban car, about 45 ft. long, will seat comfortably 48 passengers, and will weigh fully equipped 24 to 28 tons. With four 50 h.p. motors geared to about 35 to 38 miles per hour maximum speed, and with normal trolley voltage, such a car will perform very satisfactorily the service outlined.

In Fig. 1 are two curves showing the schedule performance which might be expected of the two cars, B referring to the gasolene-electric car and A to the standard interurban car. Incidentally, it is interesting to observe that as the frequency of stops increases, the self-contained car falls much more rapidly away from the schedule than the straight electric. Thus, at one stop per mile, it can do 18¾ miles per hour schedule, while the straight electric can do 21¾ m.p.h.

Under the conditions assumed, the rate of energy consumption of the straight electric car will be about 60 watt-hours per ton-mile at the motors, and this value will be used as applying to the combination, self-powered car, although, as a matter of fact, the input to the latter will be somewhat higher owing to its slower

rate of acceleration and would more than offset the elimination of rheostatic losses in the motor control.

Manufacturers of gasolene engines of the size under consideration generally claim 10 horse-power-hours output per gallon of gasolene at full load, but will guarantee only 8 horse-power-hours per gallon of this fuel. In the calculations which follow, no account will be taken of the rapid falling off in fuel economy at fractional loads, so in using the 8 horse-power-hour-per-gal. value, the error, if any, is in favor of the gasolene outfit.

Electric power station performance is well-known from numerous published or otherwise available records. The following is typical of a 4,000 k.w. turbine, water-tube boiler plant with coal at $1.60 to $1.80 per ton.

Coal	$0.0034
Labor	.0016
Maintenance	.0007
Supplies	.0003
Cost per kw.-hr. at switchboard	$0.006

A well operated plant with fairly good load factor should encounter little difficulty in producing power at this figure; indeed, many show much better results. For the purposes of this discussion, however, a higher figure, $.0085, will be taken. This value is easily attained by most of the interurban power plants in the Middle West.

Transmission efficiencies to the motors will be taken to average as follows:

	A. C. system.	D. C. system.
Step-up transformers	96 per cent.	96 per cent.
Line	97 "	97 "
Step-down transmission	96 "	96 "
Rotary	..	88 "
Car transformer	96 "	..
Feeder and trolley, net work	93½ "	89 "
Net efficiency	80 per cent.	70 per cent.

Gasolene Electric Car,
62½ tons.

62½ x 60 = 3.75 k.w.-hrs., per c. m.
3.75 x 25 = 94 k. w. average per trip.
94 k. w. = 78 per cent. of 120 k. w. the rating of the generator, and at this average load, generator efficiency equals 90 per cent. approximately.
Then

$$\frac{3.75}{.746 \times .90} = 5.6 \text{ h. p. hrs. p. c. m.}$$

The engine will develop at full load about 8 h. p. hrs. per gal. of gasolene.

With fuel at 10 cts. per gal.

$$\text{Power} \frac{10 \times 5.6}{8} = 7 \text{ cts. pr c.m.}$$

Car crew:	Per hr.
Motorman	21 cts.
Conductor	21 "
Mechanic	33 "
	75 cts.

$$\frac{75}{25} = 3 \text{ cts. per car-mile.}$$

Waste, oil, small supplies.... 60 cts.

Straight Electric Car,
30 tons.

30 x 60 = 1.80 k. w. per c. m.
1.80 x 25 = 45 k. w. avg. per trip.

Power at interurban generating station costs $0.0085 per k. w. hr. at the busses; taking transmission efficiency to the motors at 80 per cent. (A. C. system).
Then

$$\frac{1.80 \times .0085}{80} = 1.91 \text{ per c. m.}$$

Car crew:	Per hr.
Motorman	21 cts.
Conductor	21 "
	42 cts.

$$\frac{42}{25} = 1.68$$

Allow for substation attendance ..... .01 p. c. m.

1.69 p. c. m.

Waste, oil, small supplies ... 55 cts.

Summary.

7.00 cts.	Power	1.91 cts.
3.0 "	Labor	1.69 "
0.6 "	Supplies	0.55 "
10.60 cts.	Per car-mile	4.15 cts.

These are comparative costs per car-mile, exclusive of maintenance and of general expense, and are subject to considerable variation under varying conditions. The Union Pacific car, which weighs about 29 tons, has unofficially been stated to consume ½ gal. gasolene per car-mile in service involving much fewer stops. The Strang gasolene storage battery car weighing approximately 37 tons consumes, according to official statements of the builders, .45 gal. gasolene per car-mile. No statement of service conditions is given, but it is inferentially taken from the run from Philadelphia to Kansas City, where the stops were very infrequent, probably less than 1 in 20 miles.

As a check on the above calculations these data are interesting. The gasolene consumption per ton-mile works about as follows:

D. & H. car	0.0112 gal.
U. P. car	.0168 "
Strang car	.0118 "

It is not intended to compare these three types of independent motor cars, for such comparison would be manifestly unfair unless one took into account all the factors entering into the construction and operation of each of the cars. It is intended to show, however, that the calculated performance of the D. & H. car includes a margin favoring the independent motor car as compared with the standard electric.

Initial Investments.—To get down to the gist of the whole problem and to see the influence of the initial investments on a given proposition, two cases will be investigated: the first between the gasolene-electric and the standard electric, and the second between these and steam railroad service.

The first proposition contemplates the average interurban condition and may represent the competition between two paralleling roads for the local passenger and light traffic business, which is assumed to demand cars at one hour headway from 6 a.m. until 12 p.m., or 18 hours service. The items of cost and maintenance common to both roads will not enter into the present consideration, and we will assume that the general expense of administration, engineering, taxes, insurance, etc., will be the same in both. We will take the same service conditions as before, i.e., 25 miles of road, stops every three miles, and one hour for the run.

The single-phase system is well adapted to such service and will be considered in the following. It would be entirely feasible to operate with a generating plant in the center of the line feeding 6,600 volts directly into the trolley, eliminating high tension transmission and sub-station, and thereby effect a saving in the assumed case of approximately $18,000. But it might be necessary because of water supply, coal, etc., to build the power house at one end of the line and thus necessitate a sub-station. In order to be entirely fair to the gasolene car, let us assume this extreme condition.

Two cars will normally handle the service, but for special days requiring half-hour headway and for reserve, four motor cars and two trailers will be purchased. The normal daily mileage will be 900.

Estimated Cost of Straight Electric System.

Power plant	$45,000
One sub-station	2,000
Distribution system	48,000
4 motor cars, 2 trailers	36,000
Rail bonding	6,250
	$137,250
Interest and depreciation at 10 per cent.	$13,725
Or, $37.60 per day.	

Estimated Cost of Gasolene-Electric System.

4 motor cars at $17,000	$68,000
2 trailers at $3,000	6,000
	$74,000
Interest and depreciation at 10 per cent	$7,400
Or, $20.30 per day.	

The maintenance of electric cars and plants per car-mile can be gotten fairly well from the many published records, but that of the self-powered cars is at present a matter of guess. It will be taken at 4 cents per car mile, which is roughly one-half the average maintenance charges of steam locomotives per mile.

	Gasolene-electric.	Standard-electric.
Power	$7.00	$1.91
Car crews	3.00	1.68
Supplies	.60	.55
Maintenance of equipment and cars	4.00	1.50
Maint. plant and distribution system	....	.50
Operating cost per car-mile	$14.60	$6.05
Daily Cost.		
Operation	$131.40	$54.45
Interest and depreciation	20.30	37.60
	$151.70	$92.05

Thus, the difference in favor of the straight electric under the conditions assumed would be $59.65 per day, or approximately $22,000 per year.

Consider now an existing branch of a steam road where the passenger traffic is light. Service must be given even if without profit; indeed, many such branch lines are now operated at a loss so far as the passenger and light traffic is concerned. The problem then is to find the cheapest means of handling the business.

Let us take the same length of line, frequency of stops, etc., as before, but that four trains each way per day will handle the business. We will assume that the train crews when not on the passenger runs are kept employed elsewhere on the system. The steam service would call for two light locomotives and four passenger combination cars. The self-powered and the straight electric would each require two motor cars and two trailers. The trailers would not be used during the normal service, but would have to be purchased and kept to meet the demands of Sundays and special days.

It is assumed that the roundhouse, repair shop and water tanks would about balance the cost of electric car-barn and repair shop. Omitting, then, as before, all factors of cost and operation common to all three systems, we will have:

Estimated Investment for Steam Service.

2 45-ton locomotives, with tenders	$16,000
4 passenger coaches	16,000
	$32,000
Interest and depreciation at 10 per cent	$3,200
Or, $8.78 per day.	

Estimated Investment for Straight Electric Service.

Power plant	$27,000
Sub-station	1,500
Distribution system	48,000
2 motor cars and 2 trailers	21,000
Rail bonding	6,250
	$103,750
Interest and depreciation at 10 per cent	10,375
Or, $28.50 per day.	

A plant of this size would not produce power so cheaply as the

larger ones previously considered. The cost per kilowatt-hour is taken at 1½ cents, whence we have:

	Per car-mile.
Power	3.38 cts.
Labor, as before	1.69 "
Supplies, as before	.55 "
Maintenance, as before	2.00 "
	7.62 cts.

Estimated Investment Gasolene-Electric Service.

2 gasolene-electric cars	$34,000
2 trailers	6,000
	$40,000
Interest and depreciation at 10 per cent. Or, $10.90 per day.	4,000

The steam train will consist of the locomotive, tender and two cars, giving a train weight of approximately 110 tons. Under the assumed conditions of schedule, stops, weight, etc., such trains will require 35 watt-hours per ton-mile; i.e., .0745 h.p. per ton-mile. In such service the locomotive would burn about 7 lbs. of coal per horse-power-hour, and if this coal cost $2.25 per ton, the train-mile cost would be approximately:

Train Crew.

	Per hour.
Engineer	$0.35
Fireman	.21
Conductor	.30
Brakeman	.17½
	$1.03½

	Per train-mile.
Power	6.35 cts.
Maintenance locomotive and cars	8.0 "
Supplies	2.0 "
Roundhouse expense	1.0 "
Train crew	4.15 "
	21.5 cts.

The daily operating costs, exclusive of those items which are common to all the systems, would then be:

	Steam.	Electric.	Gasolene.
Operation	$43.00	$15.34	$29.20
Interest and depreciation	8.78	28.50	10.90
Total	$51.78	$43.74	$40.10

As the same equipment and therefore the same investment would be needed for a few trips more or less, and applying the same unit operating costs per car-mile and the same fixed charges, we get the following:

	Mileage.	Steam.	Electric.	Gasolene.
6 round trips, daily	300	$73.29	$51.36	$54.70
5 " "	250	62.53	47.55	47.40
4 " "	200	51.78	43.74	40.10
3 " "	150	41.03	39.93	32.80
2 " "	100	30.28	36.12	25.50
1 round trip, daily	50	19.53	32.31	18.20

This brings out clearly that in the assumed case the gasolene car is cheapest under six round trips per day, while the electric system is the cheapest at six trips or more per day. (See Fig. 2.)

Generally speaking, the gasolene car will show a saving over the steam train in light, infrequent service, but when the frequency begins to approximate 2½ hours headway between trains, the electric car is undoubtedly the cheapest and becomes increasingly so with increase of traffic frequency.

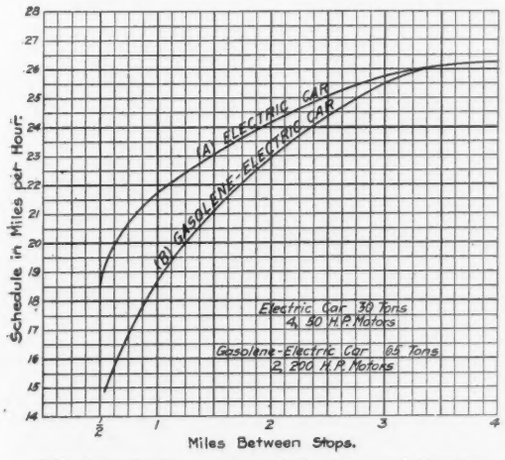
External Transmission Circuits.—We come now to what, probably more than any other factor, including even higher initial investment, has been the greatest stumbling block to the electrification of steam railroads. All other details of electric railroading have easily surmounted the objection of the steam railroad men. It is not the purpose to discuss the important subject of external transmission circuits within the limits of this paper, but it is well to point out that the progressive men in heavy railroad work no longer look upon the electrical power conductor with the doubt and misgiving, not to say scorn, with which they regarded it a few years ago. The overhead trolley has demonstrated its reliability and sturdiness on thousands of miles of electric roads from Maine to California, from the Lakes to the Gulf, in all conditions of weather and seasons. But until very recently low trolley voltage limited its use to light interurban service. The writer is quite in sympathy with the railroad men's objections to the third-rail, which, while it has splendidly performed its functions of showing the possibilities of heavy traction, is for many reasons inadvisable for surface work, although well adapted for subway or elevated roads. The advent of the single-phase system, permitting the use of high trolley voltages and hence moderate power conductors and bow trolleys, has brought the overhead trolley conductor into the field of heavy railroading and with the large eastern roads setting the pace, the early electrification of the present steam lines will inevitably come.

Conclusion.—Managers of steam railroads entrusted with the direction of large vested interests are naturally very conservative and therefore slow to make what would appear to be radical changes in their equipment. Therefore, while they realize the limitations of the steam locomotive in suburban and interurban service, they will, before stringing the trolley wire over their tracks, try out pretty thoroughly the independent motor car, which holds out alluringly the suggestion of interurban service without the power house, without the track bonding and without the external transmission circuit. This try-out will definitely establish the true field of the self-contained car, and, in the writer's judgment, this field will be the very short spurs of existing steam railroads serving sparse populations and making infrequent trips principally to connect with main line trains. Take one road, the Burlington, for example. The Galena Junction shuttle train operating on a five-mile spur, and meeting the more important trains of the main line; and the Dubuque shuttle train, which operates on the mile-and-a-quarter spur from East Dubuque over the Mississippi river bridge—these could well use such independent motor cars; unless, indeed, electric power at satisfactory rates can be purchased of the neighboring electric companies.

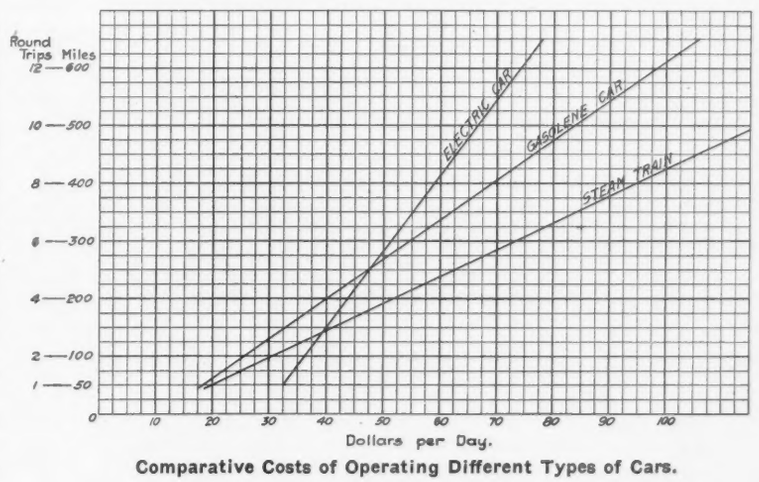
There is another field, not very wide it is true, but a profitable field which the independent motor car may enjoy with freedom from competition. The writer expects to see the present private cars of our millionaires displaced by the independent motor car, which can be made as comfortable and luxurious as any of the Pullmans now in service. Their owners may go anywhere that standard-gage tracks lead to, regardless of limitations to locomotives or to electric cars.

As to prospective interurban roads which are promoted with the view to using the gasolene or other types of independent motor, it is highly desirable to go slow and investigate. Broadly speaking, if a prospective road is to depend for revenue only on its passenger and light express traffic, and the business only warrants 1½ or more hours headway between cars, it becomes very much of a question whether or not the road will pay or ought to be built at all. But this brings us into the realm of interurban railway economics, concerning which much less even than with railway engineering it is not well to generalize. Each individual proposition should be independently examined and passed upon by a competent engineer, who should determine the equipment best fitted for it.

In city service the independent gasolene car will find only the remotest application. Under certain conditions of power plant arrangement and operation there may be isolated instances where the independent car might be called upon to handle the "owl" serv-



Schedule Performances of Electric and Gasolene-Electric Cars.



Comparative Costs of Operating Different Types of Cars.

ice in the small hours of the morning. It may also be used on such streets on which the municipality prohibits the laying of tracks. Indeed, such cars are already in operation on Fifth avenue, New York. In such service, the independent car will probably displace the so called "trackless" trolley cars, which are in use in some of the European cities.

In conclusion, the writer believes that the independent motor car will prove a useful transportation medium. Its field will be distinct from that served by the standard electric system. The likelihood of the independent motor cars becoming serious competitors of the electric cars is quite remote. Reduction in operating cost of the independent car must come about through cheaper fuel and smaller labor expense. As we all know, the price of gasolene is constantly increasing, due to the diminishing supply of the crude oil from which it is made. Kerosene engines and alcohol engines are frequently spoken of, but as yet cannot compete with the gasolene engines. The reduction in labor expense is not very promising. Advances and improvement in the art of the independent motor car will undoubtedly be made, but at the same time it must be borne in mind that the electric system will by no means stand still, and if its future progress be judged by that of the past, it will undoubtedly become the pre-eminent transportation medium.

Canadian Railroad Notes.

Ottawa, May 28.—The Government has made an important concession to the Grand Trunk Pacific. The agreement embodied in the National Transcontinental Railway Act provides that the Dominion shall give the company free all the crown lands required on the western division, between Winnipeg and the coast, for right of way and station purposes. An order-in-council recently passed gives the company the mining rights in all such lands in Manitoba and the Northwest provinces.

J. J. Hill's project for a transcontinental railroad through Western Canada has spurred the Canadian Pacific to revive its long-existing plan to build a grain elevator on the Pacific coast.

Progress of the Electrification of the West Jersey & Seashore.

The construction of the electrified section of the West Jersey & Seashore between Camden and Atlantic City is progressing rapidly. The contract for the equipment and construction of this road was let to the General Electric Company last December, the equipment to be in operation by July 1, 1906.

The work has had to be done so as not to interfere with the regular operating schedule of the present steam trains. As a consequence much track work has been done during certain hours at night. In addition to track work, bonding and pole line construction, an 8,000 kilowatt generating station and seven sub-stations are being erected and equipped. Progress on some of the sub-stations has been phenomenal. At South Camden, Glasboro, Newfield and Reega, the sub-stations are well under way, each containing two 750 kilowatt rotary converters with auxiliary apparatus with arrangements for a third complete set. At Mizpah and Clayville the equipment consists of two 500 kilowatt rotary converters with room for a third, while at Atlantic City two 750 kilowatt machines are being installed with an ultimate equipment to consist of two additional 1,000 kilowatt units. The eighth sub-station is at the main generating plant and contains two 750 kilowatt rotary converters.

The progress of the work will be clearly evident to visitors during the Atlantic City conventions. Leaving the Camden terminal on the West Jersey and Seashore Branch, those stations most advanced in construction are at South Camden, Glasboro and Newfield. The third rail construction has progressed rapidly, the over-running type of rail being mounted on reconstructed granite insulators. At crossings special jumper cable construction is employed. The cable is laid in bitumenized conduit, itself imbedded in cement. The cable ends in a bonding terminal by which it is connected to the third rail. A terra cotta cap completely protects the cable entrance of the conduit from the weather.

The bonding on the 140 miles of track is well in hand. More than two-thirds is completed, this part of the work being done under the handicap of the present operation of steam trains. In conjunction with the third rail and track bonding, a double transmission line is being run on a single set of poles. The conductors are arranged on two cross-arms with the three respective three-phase wires on each side of the pole in the usual triangle. A ground wire extends along the top of the pole line.

Current for the transmission circuits will be generated by three 2,000 kilowatt Curtis steam turbines at 6,600 volts, and stepped up to 33,000 volts for transmission. At the sub-stations the rotary converters will deliver direct current to the third rail at 650 volts. With few exceptions the over running third rail will be used throughout. In the city of Camden and between Newfield and Millville the overhead trolley will be installed.

The turbines are now in process of erection at the main station and a month from now they will probably be operating the cars over the new line—the longest section of trunk line steam road up to the present electrified.

The Inter-Pole Railway Motor.

A number of tests of the Inter-pole Railway Motor have recently been made, according to the *Street Railway Journal*, in which the most encouraging results have been obtained. From these it appears that the motor is sparkless under all conditions of operation, even though the voltage may be as high as 2,000; that it is capable of great flexibility in the matter of speed regulation; that the torque is much higher than that usually obtained with the same amount of material, so that, for a given service, it can be made smaller than others. It is argued that with these advantages a higher voltage than that usually allowable can be used.

From the diagrams published of the speed curves, that have been obtained, it appears that the average attainable is high. The line rises rapidly from the start, and swings off easily into the line of maximum speed. In these diagrams the results obtained with the inter-pole motor are superimposed upon those obtained with one of the ordinary type, and in every case those of the inter-pole are the higher. That is to say, with the more rapid acceleration possible and the higher speeds attainable it naturally follows that a given distance can be covered in a shorter time, without discomfort to passengers, than can be done with motors of the ordinary type.

There are also some other operating advantages set forth in the article referred to. In a specific case for which the calculations were made for a double equipment of 40-h.p. motors on a 17-ton car it was found that a saving of 25 per cent. of the energy could be made on a one-mile run, while the same schedule as with the ordinary motors was retained. "The possibility of operating the motors with weakened fields allows a saving of energy, from the fact that very much less resistance in the parallel positions will be used in getting the motors up to full parallel running position. This is an advantage that will appear more particularly in short runs, or where the controller is thrown on and off at frequent intervals."

In the matter of efficiency, it appears that, with 100 per cent. of field efficiency, there is a total efficiency of 85 per cent. for the motor at about 58 per cent. of load.

Foreign Railroad Notes.

Immense quantities of game birds are shipped from the forests of northern Russia to Moscow, St. Petersburg and other cities, nearly all in winter. Over a certain route the charge for such shipments by sleighs is one-third or more higher than by rail; yet the dealers in game are said to prefer the sleighs, because the carriers are responsible, and deliver at destination whatever they receive; while out of every barrel shipped by rail five to ten pairs of birds are missing when delivered.

The head of the Hungarian State Railroads since the change in the ministry is Francis Kossuth, son of the Louis Kossuth whose visit to America in 1850 was one of the great events of the time. Francis Kossuth is an engineer by profession, long connected with the Mont Cenis Tunnel and Italian railroads, and not till after his father's death in 1894 did he return to Hungary from Italy. In Hungary he has been leader of what is known as the independence party.

Indian Engineering reports successful trials of a steam rail motor car at Lahore. The car is somewhat similar in general type to those used on the Great Western Railway, England, and was imported, presumably, from that country. It is 5 ft. 3 in. gage, 64 ft. 2 in. long over buffers, and is, in effect, a small locomotive at the end of a special coach, so constructed that the locomotive can readily be detached from the coach. The latter seats three first-class, three second-class and 78 third-class passengers, as compared with about 54 on the British cars. The wheels of the locomotive are not coupled; they are 3 ft. 7 in. in diameter. The cylinders, 9 x 14 in., are outside the frame.

The General Manager of the Natal Government Railways in his report for the year 1905 makes the following comment on American cars ordered for trial: "The 10 American wagons ordered for experimental purposes were erected and brought into traffic use on the 27th of July, 1905. Thus far the wagons have done good work, but time alone will determine their efficiency in comparison with the British product. It is very apparent that the work put into the wagons has not the 'finish' of British construction, but this is a point, granting that an equally long life is obtainable from the trucks, that is not of great moment, and possibly indicates the lines upon which British builders may yet be able to supply wagons at a cheaper cost than hitherto."

GENERAL NEWS SECTION

NOTES.

In the Sundry Civil Appropriation bill before Congress there is an item of $25,000 to pay traveling expenses of the President of the United States.

According to a South Carolina paper, the superintendent of the Savannah division of the Southern Railways wants 500 additional negro laborers to lay new track, mostly side tracks, and is unable to find them, although the rate of pay has recently been advanced.

An officer of the Great Northern has announced at Great Falls that substantial reductions are to be made in freight rates to and from points in Montana on the first of July; and it seems to be the understanding that all of the three principal roads in the state will make reductions.

The State Railroad Commission of Alabama, having been asked to decide a question of fares on the Birmingham Railway, Light & Power Company has issued an opinion, concurred in by the Attorney-General of the state, that it has no authority to regulate street railways, even though they carry freight.

It is announced in California that on both of the railroads carrying fruit eastward the rates for icing have been reduced. It is expected that the green fruit shipments this season, including grapes, will amount to 7,000 cars. The number of cars of oranges already shipped east is 25,000, and the number yet to be shipped 5,000.

At Carlisle, Pa., May 23, George O. Sarvis, trainmaster of the Philadelphia & Reading, was sentenced to $1,500 fine and costs, amounting to $243, for criminal negligence in causing the collision at Moor's Mill, on Sept. 21, 1905. Sarvis was acting as pilot of a pay car train and miscalculated the time for reaching a meeting point, by reason of the failure of his watch, which had stopped. Five persons were killed in the collision.

The Supreme Court of the United States has sustained the Southern Railway in its defense of the suit brought by the State of North Carolina to compel the railroad to obey the order of the State Commission in placing cars for interstate traffic on a private siding. The suit was instituted by the State Commission against the railroad because of its refusal to obey an order directing that coal cars be placed on a certain track at Greensboro, N. C. The company expressed its willingness to place the cars on other tracks, but pleaded inability to comply with the demand as to the particular track. The railroad company attacked the law as unconstitutional on the ground that it involved an interference with interstate commerce, and the Circuit Court sustained this position. That decision is now affirmed. Justice White said that the State Railroad Commissioners have authority reasonably to regulate the delivery of freight within the state, but not to the extent of imposing a burden on commerce between the states, as was the case in this instance.

George L. Thomas, a freight broker of New York city, and L. B. Taggart, his clerk, tried at Kansas City, have been found guilty of conspiracy to secure unlawful freight rates. Thomas acted as the New York agent for western consignees, a number of these testifying that they paid him annual salaries. One merchant paid Thomas $500 a year, another one $1,000, and others different amounts. These merchants received large sums of money, sometimes by express and sometimes by the hand of an unknown messenger, but always from some source which the witnesses declared was unknown to them; but the impression produced by the testimony as a whole was that these moneys came from Thomas, who had received them from the railroads in the shape of rebates on goods shipped. One firm, according to the testimony of one of its members, had received $43,000 in this way within the space of three years. One witness testified that Thomas's business had been going on for four years and that rebates amounted to 25 per cent. of the freight rates; but another, a wholesaler in Kansas City, said that it had been going on not four years but 25 years, and that the rebates amounted more nearly to 40 per cent. than to 25 per cent. George H. Crosby, of the Burlington road, tried at the same time, was discharged, the court sustaining a demurrer alleging that no evidence had been given to connect him with a conspiracy.

At a hearing in Cleveland, May 24, Interstate Commerce Commissioners Prouty and Clements took further testimony concerning the relations of the railroads to the oil business. J. W. Lee, of Pittsburg, Pa., told of forming a number of oil companies and of being obliged to do business at a loss because the railroads aided the Standard Oil Company in taking business away from other oil companies. Had it not been for the establishment of an independent pipe line to the sea coast the independent oil companies in western Pennsylvania would have been killed off. F. B. Westgate, of Titusville, Pa., who has been a producer of oil for 19 years, testified that up to 1886 the railroads gave low through rates to New England, but in that year made an advance from 28½ cents per 100 gallons to 40 cents; and the high rates have continued until the present month, when a reduction has been made. Frank B. Fretter, Secretary of the National Refining Company of Cleveland, and President of the National Pipe Line Company of Ohio, testified that for over three years his companies had trouble in making shipments from Memphis to points in Arkansas, and he found that the agents of the roads were also agents of the Waters-Pierce Oil Company of Missouri, a Standard adjunct. These agents, he said, deliberately side-tracked shipments in order to destroy his trade. Mr. Fretter said, concerning the lubricating oil contract which he attempted to get from the Rock Island ten years ago, that he offered his oil at a figure low enough to enable the railroad to save a large amount of money, but that, notwithstanding, he was "turned down" in favor of the Standard. Black oil, for which the Standard Company obtained 12 cents a gallon, his company would be glad to sell at 5 or 6 cents in bulk.

Single-Phase Railway Equipment for Anderson, South Carolina.

The Anderson Traction Company, Anderson, South Carolina, is building the first section of an interurban electric road which will eventually extend to Greenville, 35 miles. Anderson is the center of the cotton mill district in the south and this line will connect it with the surrounding cotton mill towns and with the main line of the Southern Railway. In the city there is already a direct-current railway and the first branch of the interurban is a continuation of the present line as far as Belton, ten miles. Complete station apparatus and motor equipments for single-phase operation have been ordered for the extension. The new cars are of the heavy interurban type and are each equipped with four G.E.A.-605 (75-h.p.) single-phase motors, adapted for operation at 3,300 volts alternating current on the interurban section of the road, and at 550 volts direct current on the present direct current city lines. Each car is fitted with air-brakes, for which the motor compressors are adapted for operation on either direct or alternating current, this apparatus also being furnished by the General Electric Company. Power for the operation of this road will be purchased from the Savannah River Power Company, delivered at a sub-station in Anderson at 66⅔ cycles. In the sub-station there will be a three-unit motor-generator set, consisting of an induction motor driver, direct-connected to an AC generator for the single-phase portion of the line and a direct-current machine to supply the present city line. The driving motor consists of a two-phase, 66⅔ cycle, 1,150 volt induction motor, receiving its current from the 66⅔ cycle supply above mentioned. Direct-connected to this is a 300 kilowatt, 25-cycle, single-phase, 3,300 volt, alternating current generator which will furnish the 10-mile single-phase section now under construction with current directly to the trolley at 3,300 volts without sub-stations. The remaining machine for furnishing the direct current consists of a 250-kilowatt, 600-volt railway generator, complete with an exciter on the same shaft as the other three machines. The officers of the Anderson Traction Company are: J. A. Brock, President; F. G. Brown, Vice-President; Dr. Geo. E. Coughlin, General Manager. The road is being built under the direction of Mr. J. E. Sirrine, Engineer, Greenville, S. C., with Mr. E. F. Lilly, Columbia, as Consulting Electrical Engineer. General Electric Company apparatus is being used throughout.

Derailment at Louisville.

A press despatch from Louisville, Ky., May 28, says that a passenger train of the Louisville & Nashville, from Knoxville, backing toward the Union Station, was derailed in the yard in Louisville on that day, at Seventh and Hill streets, causing the death of eight persons and injury of 15 others. Three passenger cars, after jumping the track, crashed into freight cars standing on the siding.

English Import Rates on Agricultural Produce.

A committee appointed to inquire whether preferential treatment was accorded to foreign agricultural produce as compared with home produce in its report just issued finds that while lower rates and greater facilities exist which constitute a preference to colonial and foreign product, this *prima facie* preference is justified, for "the local trader cannot expect for small, irregular and often ill-packed consignments, the same rates and facilities as are given to the large, regular and well-packed consignments, with which he is in competition." In order to claim comparatively equal rates and facilities, "he must organize something like a reasonable approach to the conditions under which the competing trade is carried on." Then the British trader is held to be entitled "to demand as a right"

such rates and facilities as will place him on a comparative equality with his foreign or colonial rival. No legislative measures were considered necessary.

Tax on New York Central Cars.

The New York Central has lost its suit against the Controller of the state of New York contesting the taxes on its freight cars. Under a law of 1896 the railroad is taxed on its capital stock representing its cars at the rate of 1.5 mills on the dollar on the valuation of equipment employed in the state of New York. The road contended that ⅓ of its cars were in service outside of the state, but the Supreme Court of the United States sustains the opinion of the state court that the tax must be paid, the situs of the cars being in New York, notwithstanding their absence much of the time. The opinion, by Justice Holmes, says: "We are bound by the construction given by the state court. In this case we are to assume that the statute purports and intends to allow no deduction from the capital stock taken as the basis for the tax unless some specific portion of the corporate property is outside of the state during the whole tax year. We must assume further that no part of the corporate property in question was outside the state during the whole tax year. The reports show only that the cars made so many miles, and it might be ten and it might be fifty cars that made them. Certainly no inference whatever could be drawn that the same cars were absent from the state all the time. We are not curious to inquire exactly what kind of a tax this is to be called. If it can be sustained by the name given to it by the local courts it must be sustained by us. It is called a franchise tax in the act, but it is a franchise tax measured by property."

The case covered the taxes for 1900, 1901, 1902, 1903 and 1904, and the amount involved was $889,375.

Contracts for Mammoth Stations in New York.

The contract for building the great Pennsylvania Passenger Station at Seventh and Eighth avenues and 31st and 33d streets, New York, has been let to the George A. Fuller Company, of New York. Just when work will be started on the building is not stated, as the excavation is not finished; but there is nothing to hinder the beginning of foundations within a few weeks.

A contract has also been let to the George A. Fuller Co. for putting up the large terminal building for the Hudson Companies' (Cortlandt street) Hudson River tunnel. This building is to occupy two blocks on the west side of Church street from Cortlandt to Fulton street. The ground is already partly cleared of the old buildings. This building is to be 21 stories high, all the floors above the street level to be rented for offices.

New York City Rapid Transit.

Bids are wanted June 4 by the Board of Rapid Transit Commissioners for making test borings on the lines of the proposed rapid transit routes in the Boroughs of Manhattan, Bronx, Brooklyn and Queens, New York City. Alexander E. Orr is President of the Commission.

Baltimore & Ohio Improvements at Cleveland.

The Baltimore & Ohio Railroad is to make extensive improvements to its terminals at Cleveland, Ohio, and plans and specifications have been sent out to contractors. A ten-stall brick roundhouse is to be built; a gravity coal tipple with capacity for 360 tons; frame sand house with a capacity for 45 tons of dry sand; engine room, 20 ft. by 60 ft.; boiler room, 40 ft. by 60 ft.; machine shop, 60 ft. by 90 ft.; oil and store house, 30 ft. by 45 ft., and office, 15 ft. by 70 ft. There will be a trainmen's building 35 ft. by 50 ft., with bath and locker rooms for the enginemen and trainmen. The second floor will have lounging and bunk rooms. There will also be a standard 80-ft. turntable pit and a double ash pit, 150 ft. long, to be equipped with hoisting crane and automatic grab buckets.

New Atchison Freight Sheds at San Francisco.

General Manager A. G. Wells, of the Atchison, Topeka & Santa Fe Coast Lines, has let contracts for the erection of two large freight sheds at China Basin on the San Francisco water-front near Kentucky street. A 30-ton electric traveling crane and two 15-ton electric derricks for handling freight will be put in. About $300,000 will be spent on the improvements for this terminal. A large number of new sidings will be laid in the yards.

Bids for Tunnel Work in New Zealand.

The New Zealand Government is asking for bids for piercing a tunnel over five and one-quarter miles long, much longer than any railroad tunnel in the southern hemisphere. The tunnel is to be bored through the main central range of mountains of the Middle Island at Arthur's Pass. It will pass under the coach road through Otira Gorge, a well-known scenic spot. The tunnel will form part of a railroad now under construction connecting the east and west coast districts of the Middle Island. The lowest passes in the dividing range are 3,000 ft. high. The ascent from the western side is steep, through a difficult country for railroad building. The road has been completed and opened for traffic to a point about two miles from the western end of the tunnel. It is proposed to operate the tunnel section of the road, when completed, by electricity generated by power obtained from the Otira river.

TRADE CATALOGUES.

White Pass & Yukon.—The traffic department of the White Pass & Yukon Railroad reprints from "Alaska and the Klondike," by John S. McLain, a tempting description of the journey between Seattle and Dawson, which is accompanied by 23 quite remarkable photographic reproductions of this northern country. The account is well written and the pictures are distinctly worth seeing.

Northern Pacific.—The passenger department of the Northern Pacific has issued a fascinating pamphlet descriptive of the Shasta-Northern Pacific route to and from California. The illustrations throughout have been selected with great care and are printed in the most artistic manner. This is one of the best examples of good railroad advertising that we have seen.

Hand and Push Cars and Velocipedes.—A pamphlet of 44 pages just issued by the Buda Foundry & Manufacturing Co., Chicago, fully illustrates and describes the various styles of hand and push cars and velocipedes made by this company. A complete list of repair parts and prices is given, and sizes, prices and a detailed description of Buda pressed steel wheels.

Air Compressors and Appliances.—The Ingersoll-Rand Co., New York, has issued a small pamphlet describing and illustrating air compressors, pneumatic hammers, drills and pumping systems for railroad use. Lists are given of railroad companies using each type of machine.

Manufacturing and Business.

Swift & Company have asked prices on lumber for 150 refrigerator cars to be built at their own shops.

The current issue of the *Electrical World* contains a full illustrated description of the electric and mechanical equipments for the new Engineers' Club, on West Fortieth street, New York.

John T. Bramhall, formerly advertising agent for the Michigan Central, and before that with the Monon Route, has embarked in business for himself as a compiler of railroad and resort literature. His office is at 6310 Harvard avenue, Chicago.

The Bettendorf Axle Co., Davenport, Iowa, has an order from Swift & Co. for the steel underframes and trucks for twenty 30-ton tank cars, the tanks for which will be built at the latter's shops. Also, an order has been received from the Mineral Paint Zinc Co. for the steel underframes and trucks for fifty 40-ton tank cars.

Iron and Steel.

Bids are wanted June 7 by P. E. Ryan, Ottawa, Ont., Secretary of the Transcontinental Railroad Commission, for 65,000 tons of 80-lb. rails, open hearth or Bessemer, with the necessary fastenings, and for 1,545,000 ties.

The Great Northern is negotiating for 50,000 tons of rails and the Chicago, Burlington & Quincy for an additional 35,000 tons. Inquiries for rails aggregating 250,000 tons are being made. The orders for structural steel given for May amount to 100,000 tons. There is a strong demand for steel making iron, and raw steel continues scarce. The American Bridge Co. has taken the order of the George A. Fuller Co. for the steel for the tunnel terminals of the Hudson Companies in New York, about 28,000 tons. The steel will be delivered from the Pencoyd and the Trenton works of the company, deliveries to be made at the rate of from 3,000 to 5,000 tons a week after the initial shipment.

The Baltimore & Ohio has given an order to the Baltimore Bridge Co. for putting up its new steel pier at Locust Point, Md., requiring about 2,000 tons of steel. The American Bridge Co. has received an order for 500 tons of elevated railroad structure from the Chicago & North-Western in Chicago, and the Erie is negotiating for 7,000 tons of steel to be used in two large viaducts, one of which will be over the Genesee river. Orders for rails recently given for this year's delivery include, the Norfolk & Western, 10,000 tons; Grand Trunk, 5,500 tons; Boise City & Idaho, 2,100 tons, and Los Angeles & Pacific, 2,500 tons. The Tennessee Coal, Iron & Railroad Co. has received a contract for 50,000 tons of rails from the Southern Pacific for 1907 delivery. Large exports of rails are being made to Mexico, Brazil, Argentine Republic and other South American countries.

OBITUARY NOTICES.

R. L. Holliday, Superintendent of the Delaware division of the Philadelphia, Baltimore & Washington, who died recently, was a graduate of Rensselaer Polytechnic Institute. His first railroad

work was in 1869 as a rodman on the Bell's Gap. He was Assistant Engineer on that road until 1873. Since 1876 he has been on the Pennsylvania system, having been Supervisor of different divisions, then Assistant Engineer of the Pittsburg division and later Engineer of Maintenance of Way at Altoona. Since 1883 he has been consecutively Superintendent of the Bedford and Lewistown divisions, Superintendent of the Central division of the Philadelphia, Wilmington & Baltimore, now the P., B. & W., and finally Superintendent of the Delaware division of that road.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Engineers' Club of Philadelphia.

At a business meeting of this club to be held June 2 there will be a paper on "The Fireman and His Relation to Maintenance of Way Organization," by S. W. Kapp; also one on "The South & Western Railway," illustrated by lantern slides, by Edward S. Hutchinson.

Freight Claim Association.

The fifteenth annual meeting of this Association was held at St. Louis May 16, 17 and 18, President Robt. L. Calkins (N. Y. C.) in the chair. About 130 members were present. The President delivered an address congratulating the Association on the increase in membership during the past year. It is the success of this association that has led to the organization of the several claim conferences in the principal railroad centers. . . . That there is great need for some effectual but reasonable action which will insure a more expeditious return of claim papers to the carrier against which the claim is made all members will doubtless admit. It is our plain duty to find a remedy for this evil.

An amendment was made to Section 1, Article II., of the Constitution, making the membership of the Association to include General Freight Agents, Freight Claim Agents, or other authorized representatives having charge of the freight claims of such railroads, transportation lines or companies as shall be admitted to membership.

Three morning and two afternoon sessions were well filled with profitable discussions, the reports considered being those of the committees on constitution, on loss and damage rules, on overcharge rules, on uniform blanks and on methods and topics.

The Secretary's report showed 275 members, representing 196,000 miles of railroad. Twenty-eight new members joined the Association during the period from May 1, 1905, to May 1, 1906. The following officers were elected for the ensuing year: President, Robert Kirkland (I. C.), Chicago; First Vice-President, J. E. Leith (S. L. & S. F.), St. Louis; Second Vice-President, A. B. Thompson (D., L. & W.), New York; Secretary and Treasurer, Warren P. Taylor (R., F. & P.), Richmond, Va. Denver, Colo., was selected as the place for holding the next meeting, on June 19, 1907.

The local entertainment committee entertained the visitors with unbounded hospitality.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Pennsylvania.—Robert Pitcairn, Resident Assistant to the President at Pittsburg, Pa., was retired on a pension on June 1. Mr. Pitcairn was born in Scotland in 1836, and his entire railroad service has been on the Pennsylvania. He began as a telegraph operator in 1853, and later went into the General Superintendent's office at Altoona. In 1861, he was appointed Superintendent of the Middle division, and in 1862, Superintendent of Transportation. During the next three years he was Superintendent of several divisions and in 1865 he was appointed Superintendent of the Pittsburg division. He remained in this office until 1902, when he was appointed Resident Assistant to the President.

C. M. Bunting, Chief Clerk to the First Vice-President, has been appointed to the new office of Assistant to the First Vice-President. A. J. County, Assistant Secretary, has been appointed to the new office of Assistant to the Third Vice-President.

Operating Officers.

Chicago, Indiana & Southern.—H. A. Ziesel, Superintendent at Kankakee, Ill., has been appointed Superintendent at Hammond, Ind., succeeding F. T. Bowles, who is transferred to Kankakee.

Chicago, Milwaukee & St. Paul.—E. D. Sewall, Assistant General Superintendent at Minneapolis, Minn., has been elected Vice-President of the Chicago, Milwaukee & St. Paul of Montana, with office at Chicago, Ill. H. B. Earling, Assistant General Superintendent at Milwaukee, Wis., succeeds Mr. Sewall.

Cleveland, Cincinnati, Chicago & St. Louis.—P. J. Maloney, trainmaster at Riverside, Ohio, has been appointed Superintendent at Mt. Carmel, Ill., succeeding J. S. Sweeney, transferred.

Marcellus & Otisco Lake.—R. L. Scott has been appointed Superintendent, with office at Marcellus, N. Y., succeeding C. Cooper.

Pullman Company.—S. C. Gardner, Assistant District Superintendent at San Antonio, Tex., has been appointed to the new office of District Superintendent at Monterey.

St. Louis Southwestern.—C. W. Nelson, Assistant to the Vice-President and General Manager, has been appointed Assistant General Manager, with office at St. Louis, Mo.

Traffic Officers.

Seaboard Air Line.—S. C. Boyleston, Jr., has been appointed Assistant General Passenger Agent at Jacksonville, Fla., succeeding A. O. MacDonell, transferred.

Engineering and Rolling Stock Officers.

Chicago, Indiana & Southern.—The office of J. F. Flavin, Assistant Master Mechanic, has been removed from Kankakee, Ill., to Hammond, Ind.

Mexican Central.—S. E. Kildoyle, formerly Master Mechanic of the Southern Pacific at Guaymas, Mex., has been appointed Master Mechanic of the Mexican Central at Mexico City, succeeding L. Strom, resigned.

LOCOMOTIVE BUILDING.

The Lorain Steel Co. has ordered one locomotive from the Baldwin Works.

The Atchison, Topeka & Santa Fe, it is reported, has ordered 15 locomotives.

The Macon, Dublin & Savannah has ordered one locomotive from the Baldwin Works.

The West Virginia Northern has ordered one locomotive from the Baldwin Works.

The Norfolk & Southern is in the market for passenger, freight and switching locomotives.

The Virginia & Southwestern has ordered four locomotives from the American Locomotive Co.

The Santa Fe, Prescott & Phoenix has ordered three locomotives from the American Locomotive Co.

The New York, Pennsylvania & Southwestern, formerly the Binghamton & Southern, is considering the purchase of locomotives. Address D. E. Baxter, General Manager, 27 William street, New York.

The Lima Locomotive & Machine Co. reports the following orders for Shay locomotives for the week ending May 26, 1906: G. A. Goodyear Lumber Co., Tomah, Wis., one 45-ton locomotive; Lewisburg & Ronceverte Electric Railway, Lewisburg, W. Va., two 45-ton locomotives; Grantland & Lumber Co., Selma, La., one 37-ton locomotive; Culbreath Logging Co., Huttig, Ark., one 37-ton locomotive; Flint, Erving & Stoner Lumber Co., Dunlevie, W. Va., one 65-ton locomotive, and the Title Guarantee & Trust Co., Tampa, Fla., one 14 x 20 Mogul locomotive.

CAR BUILDING.

The Illinois Central has ordered one private car from the Pullman Co.

The Atlantic Coast Line, it is reported, is asking prices on passenger cars.

The Great Northern is in the market for 3,000 box cars of 80,000 lbs. capacity.

The Kingan Refrigerator Line is in the market for a number of refrigerator cars.

The Atlantic Coast Line has ordered 500 coal cars from Barney & Smith for December, 1906, delivery.

The Oklahoma Central, it is reported, is in the market for freight cars. Address R. L. McWillid, Lehigh, Ind.

The Strobel Steel Construction Co., Chicago, has ordered one flat car of 80,000 lbs. capacity from the Bettendorf Axle Co.

The Louisville & Nashville shops at Decatur, Ala., are turning out 75 new box cars every week. The number of men employed at these shops at present is about 3,500.

The New York, Pennsylvania & Southwestern is considering the purchase of a number of coal cars. Address D. E. Baxter, General Manager, 27 William street, New York.

The Tampa Northern is in the market for upwards of 125 box and flat cars of from 50,000 lbs. to 60,000 lbs. capacity. Address Benjamin Thompson, Chief Engineer, Tampa, Fla.

The Burrs Ferry, Browndell & Chester will shortly order a number of flat cars and box cars. Address Joseph A. Turner, General Superintendent and Purchasing Agent, Rockland, Tex.

The Canadian Pacific is building 1,000 box cars of 60,000 lbs. capacity at its Angus shops. These cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements. The special equipment will include the Simplex bolsters and brake-beams, Christie brake-shoes, Westinghouse brakes, Tower couplers, positive door fastenings, Security doors, Miner draft rigging, Harrison dust guards, McCord journal boxes and Chicago-Winslow improved roofs.

The Isthmian Canal Commission opened bids at Washington on May 19 for 1,000 wooden flat cars of 80,000 lbs. capacity. The lowest bidder was the South Atlantic Car & Manufacturing Co., at $1,129.22 each, delivered and erected at Colon, delivery not to commence for 230 days. The next lowest bidder was the American Car & Foundry Co., at $1,145 each, delivered and erected at Colon, delivery to be at the rate of 200 cars a month, commencing in September. Bids were also submitted by the Pullman Company, Mount Vernon Car & Manufacturing Co., Standard Steel Car Co., and J. K. Joice.

The Philadelphia Rapid Transit Co. has ordered 100 Brill semi-convertible passenger cars from the J. G. Brill Co., for August, 1906, delivery. These cars will weigh 36,000 lbs., and will have a seating capacity for 48 passengers. They will measure 28 ft. long by 7 ft. 6 in. by 8 ft. high, all inside measurements. The bodies and underframes will be of wood. The special equipment will include the 4-in. hammered steel axles, Curtis bolsters and brake-beams, National Electric Co.'s air-brakes, Acme curtain fixtures, Pantasote curtain material, Brill door fastenings, double doors and draft rigging, Consolidated Car Heating Co.'s electric heating system, Curtis journal boxes, open platforms, Curtis springs and trucks, Schoen steel wheels, and Philadelphia Rapid Transit Co.'s brasses, couplers, paint, vestibules, and brake-shoes.

BRIDGE BUILDING.

Albany, N. Y.—Under an act passed by the Legislature this year Governor Higgins has appointed a commission consisting of Alexander J. Shamberg, McDougall Hawkes and E. W. Bloomingdale, of New York, to confer with representatives of New Jersey to secure legislation for the appointment of a joint commission to buy land and water rights, and to secure the necessary federal consent for the construction of one or more bridges over the Hudson river from New York to New Jersey, at the joint expense of the two states.

Boston, Mass.—The Cambridge Bridge Commission, consisting of the Mayors of Boston and Cambridge and City Engineer Jackson, it is said, has given the contract for building the four towers on piers five and six of the new Cambridge bridge to Jones & Meehan at their bid of $99,400. The other bids submitted were Holbrook, Cabot & Rollins Corporation, $102,500; L. D. Wilcutt & Sons' Co., $103,000; Austin Ford & Son Co., $106,864, and Antony Cefale, $111,900.

Brantford, Ont.—The city and Grand Trunk is to jointly build a combined railroad and highway bridge over the river. Address City Engineer Barrow.

The Grand Trunk will build a bridge over its tracks at Emerald street. There will be one 56-ft. and two 37-ft. spans. Address Engineer Somerville.

Campbellton, N. B.—Thomas Malcolm has been granted a charter for a combined highway and railroad bridge over the Restigouche river. Surveys and plans are now being made. Estimated cost $600,000.

Lethbridge, Alb.—The Canadian Pacific has plans for a high level bridge to be built here at a cost of $1,000,000. F. F. Busteed is Chief Engineer for lines west, Winnipeg, Man.

Mt. Vernon, Ohio.—The Commissioners of Knox County have transferred $30,000 from the building fund to the bridge fund, to be used for building new bridges and for repairs to others.

New York, N. Y.—The Board of Estimate and Apportionment has voted an appropriation of $50,000 for preliminary work for the Riverside drive improvements. The plans call for a stone viaduct over Inwood Valley to cost $2,500,000.

Pine Bluff, Ark.—Preliminary surveys are being made by the Bridge Commissioners for a combined highway and railroad bridge to be built over the Arkansas river at this place.

St. Anne's, Que.—The Canadian Pacific is to rebuild the large bridge over the Ottawa river at this place.

Wilmington, Del.—Bids are wanted June 11 by the Board of Water Commissioners for building a seven arch reinforced concrete bridge 350 ft. long over Brandywine creek for the Water Department. Theodore A. Leisen is Chief Engineer.

Winnipeg, Man.—H. N. Ruttan, City Engineer, estimates the overhead bridge to be built over the Canadian Pacific tracks will cost $170,000.

Other Structures.

Atlantic City, N. J.—The West Jersey & Seashore, it is said, is to spend about $600,000 for its new terminal station here.

Birmingham, Ala.—The Illinois Central, reports say, will spend $100,000 for a new freight house on land recently bought near First and Second avenues, between Thirteenth and Sixteenth streets. F. T. Oren, Assistant Engineer, will have charge of the work.

Fremont, Neb.—The Chicago, Burlington & Quincy, local reports state, will build here a passenger station to cost $40,000.

Lethbridge, Alb.—The Canadian Pacific will at once commence putting up terminal shops here, including engine shops, coaling station, roundhouses, freight sheds and repair shops. F. F. Busteed is Chief Engineer of the western lines, Winnipeg, Man.

Stockton Springs, Me.—The Bangor & Aroostook, in addition to the three wharves already completed, will build an additional wharf at Speed's Cove, Cape Jellison. An addition of 500 ft. will also be built to the big Cape Jellison wharf, and 500 ft. to the Pole wharf at Mack's Point. The work has been given to Contractor Spellman, of Bangor, Me.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Abilene Northern.—See Colorado & Southern.

Alabama Central.—Incorporated in Alabama with $100,000 capital by W. C. Davis, A. Russell, O. C. Simmons and other Chicago capitalists, with office at Jasper, to build a railroad from Tuscaloosa, Ala., north through Tuscaloosa, Walker, Winston, Lawrence and Morgan Counties to Decatur, about 125 miles.

Atchison, Topeka & Santa Fe.—A blue-print has been submitted to the Texas Railroad Commission by this company showing the location of the cut-off line which is being built through eastern New Mexico and western Texas. Most of the line on the Transcontinental division, from Rio Puerto to Texico on the New Mexico-Texas border, has been completed. Track-laying will be begun in July on the 70 miles from the Pecos river to a connection with the El Paso & North-Eastern at Vaughn Junction. It is expected to have the road ready for operation by January of next year.

A profile of the proposed branch line of the Pecos Valley & Northwestern division from Canyon City, Tex., south to Plainview has also been filed with the Railroad Commission. Grading is to be finished and much of the track laid by July of this year. This branch line will be extended south from Plainview for about 50 miles to connect with the proposed extension of the New Texico line when it is built east to Brownwood, where it will connect with the Gulf division of the A., T. & S. F. The route of the extension from Texico to Brownwood has not yet been definitely located.

Atlantic Coast Line.—This company, it is said, will extend its line from Newberry, Fla., northwest about 75 miles to Perry.

Beaumont & Great Northern.—This company has notified the Railroad Commission of Texas that 12 miles of track have been laid and that by July 1 its line is to be completed to Onalaska, 20 miles from Trinity. The line, about 110 miles long, is being built by the Gould interests to secure a direct entrance into Southwest Texas. It will probably be operated when completed as a part of the International & Great Northern.

Brinson Railway.—Incorporated in Georgia with $1,000,000 capital and office at Savannah to build from Savannah northwest through Chatham, Effingham, Screven, Jenkins, Burke, Jefferson, McDuffie, Wilkes, Oglethorpe and Clarke Counties to Athens, about 180 miles. George M. Brinson, of Emanuel County, is the principal promoter. The incorporators are George M. Brinson, Charles Neville, Y. E. Bargeron, W. A. Beale, W. C. Myers, C. H. Mason, J. H. Dazemore, H. W. DeLoach, E. F. Rogers and W. L. Clarke, all of Emanuel County.

Buffalo, Lake Erie & Niagara.—The State Railroad Commission is considering the question of granting a certificate to this company, which proposes to build a line around Buffalo. A harbor is to be made at Bay View on the lake shore, protected by a breakwater 4,000 ft. long and piers with room for 16 of the largest lake freight steamers; also freight yards and warehouses. The directors include: C. N. Bushnell, J. H. Metcalfe and H. W. Putnam, all of Buffalo. (See Construction Record.

BUFFALO, LOCKPORT & ROCHESTER (ELECTRIC).—Work on this proposed electric road has been begun, and it is planned to have one track completed this fall. The proposed route is from Rochester, N. Y., west to Lockport, 56 miles. From Lockport connection is to be made with Buffalo and Niagara Falls by the International Railway. The line parallels lines of the New York Central for the entire distance. The company has a capital of $4,000,000. It has had its bonds underwritten by the Traction Finance Co., of New York, and by interests allied with the Mackenzie & Mann syndicate of Toronto, Can. The power for operating the road is to be furnished by the Electrical Development Co., of Ontario, and the Niagara Falls Electrical Transmission Co. Charles B. Hill, of Buffalo, is President. The directors are Sir Henry Pellatt, E. R. Wood, Frederick Nicholls and D. E. Thomson, of Toronto, and Edmund Wragge. (May 25, p. 155.)

CENTRAL & SOUTHEASTERN.—This company, incorporated in Kansas last year, has given a mortgage to the Lincoln Trust Co., of New York, to secure funds to take up the outstanding bonds of the Arkansas, Missouri & Kansas, of which this company is a reorganization, and to build the road projected from Chanute, Kan., through Missouri and Arkansas to Memphis, Tenn., 425 miles. Reports say that work is now going on between Chanute and Joplin, Mo. The road will intersect about 20 railroads. Albert N. Hoxie is President; D. W. Spooner, Manager and Chief Engineer, and F. S. Hoxie, Secretary, 273 Fifth avenue, New York.

CENTRAL OF GEORGIA.—This company is locating a line from Albany, Ga., south to Quincy, Fla., by way of Newton and Bainbridge, Ga., to traverse the counties of Dougherty, Baker, Mitchell and Decatur in Georgia, and Gadsden County, Fla., about 60 miles through large mill and turpentine territory.

CHICAGO, MILWAUKEE & ST. PAUL.—The Idaho section of the Pacific extension now under construction will be built under the name of the Chicago, Milwaukee & St. Paul Railway of Idaho, which was incorporated early this year.

CHICAGO, ROCK ISLAND & PACIFIC.—An officer writes that the budget for expenditures to be made in 1906 includes the following: Roadway, $2,060,437; bridges, $706,000; buildings, $1,760,600, and other additions and improvements, $250,000, making a total of $4,777,037.

CHICAGO SUBWAY.—President A. G. Wheeler, of the Illinois Tunnel Co., is quoted as saying that active operation of the tunnel will begin soon. By August 1 connections will be made with 56 buildings that each receive and send 500 tons and upwards every day; and connection will also by that time be made with all the railroads.

CLEVELAND, ASHLAND & MANSFIELD.—Recently incorporated in Ohio with $500,000 capital to build from Ashland southwest to Mansfield, 14 miles. Construction work is under way already. The contract for the grading is held by L. B. Stanley & Co., Collinwood, Ohio. Contracts for the bridges and culverts and other material and equipment will soon be let. The company's office is in the Williamson Building, Cleveland, Ohio. (May 18, p. 149.)

COLORADO & SOUTHERN.—A plan of the proposed extension southwest from Seymour to Stamford of the Wichita Valley to connect the Abilene Northern has been filed in Texas. Both of these roads are owned by Colorado & Southern interests. The plan shows that the extension will be 60 miles long. The Abilene Northern is building from Stamford south to Abilene, 40 miles. The bridge over the Brazos river at Seymour has been completed and track-laying is now in progress. It is proposed to have the road completed to Stamford by Sept. 1, and to Abilene by Nov. 1 of this year.

COLORADO & SOUTHWESTERN.—Incorporated in Colorado, with a capital of $3,500,000, to build a railroad from Grand Junction in Mesa County, Colorado, south through Unaweep canyon to La Sal Mountain, thence through the Sinbad and Paradox valleys, traversing valuable mineral regions in the La Sal Mountains. Grand Junction is the western terminus of the Denver & Rio Grande and the Colorado Midland and the eastern terminus of the Rio Grande Western. D. C. Willerby, of London, England; A. E. Guy and John Nix, of Norwood, Colo., and J. H. Hinkin, of Chicago, are promoters. A contract is reported let for building the first 10 miles.

DELAWARE & HUDSON.—A contract is said to have been let by this company to the Pacific Construction Co., and sublet to Roger & Quirk, for building the first 15 miles of a branch from Rouses Point, N. Y., to Adirondack Junction, Que., on the Canadian Pacific, to enable the D. & H. to reach Montreal over the Canadian Pacific tracks.

FLORIDA RAILWAY.—This company, formerly the Liveoak & Gulf, is planning to extend its road from Liveoak, Fla., northeast to Fernandina, about 150 miles.

GEORGIA & FLORIDA.—A syndicate composed of Middendorf, Williams & Co., and the International Trust Co., of Baltimore, and John L. Williams & Sons, of Richmond, Va., has bought six or seven lines of railroad in Georgia and Florida aggregating 230 miles. The syndicate plans to build connecting links aggregating 100 miles to unite these several lines and form a continuous railroad from Augusta, Ga., to Madison, Fla., with several branches. The question of further extending the consolidated road to Deepwater on the Gulf of Mexico is also under consideration. J. Skelton Williams is President and C. Gabbett, formerly of the Augusta & Florida, is General Manager.

GEORGIA, FLORIDA & ALABAMA.—Routes have been surveyed for the proposed extension of this road from Columbus, Ga., south to Cuthbert. One of the routes is by way of Lumpkin, another by Richland, and a third by way of the Chattahoochee Valley. It is probable that the first mentioned route will be decided upon.

GEORGIA SOUTHEASTERN & GULF.—Recently incorporated in Georgia to build a railroad from Albany, Ga., southwest about 150 miles to St. Andrews, Fla., on the gulf shore. The incorporators include W. M. Legg, former General Manager of the Georgia, Florida & Alabama; H. J. Bruton and M. D. Powell, of Bainbridge; W. W. Gordon, Jr., of Savannah; W. H. Hilton, of Marianna; L. V. Babcock, of Pittsburg, Pa., and G. J. Pope, of Chicago.

GREAT NORTHERN.—This company is building a new line from Aneta, N. Dak., northwest to Devils Lake, approximately 60 miles.

GULF & SHIP ISLAND.—The new electric line which this company is building under the name of the Gulfport & Mississippi Coast Traction is to be completed from Gulfport to Biloxi June 1. The line is now in operation from Biloxi to Beauvoir.

GULFPORT & MISSISSIPPI COAST TRACTION.—See Gulf & Ship Island.

INTEROCEANIC.—At the next meeting of the Board of Directors, plans for converting this road to standard gage will be considered. The cost of the change, with other proposed improvements, will be about $6,000,000, which expenditure has already been approved by the Board of Directors. Surveys under way for over a year for eliminating curves have recently been completed.

LOUISIANA RAILWAY & NAVIGATION CO.—This company expects to have its road extended by September to New Orleans, La. On the completion of this extension the road will extend from Shreveport, La., southeast to New Orleans, 350 miles. At New Orleans the terminal facilities are practically completed. The road is laid with 70-lb. rails throughout. At Water Valley the Mississippi river is crossed by ferry. (See Construction Record.)

MISSOURI PACIFIC.—Preliminary surveys are being made by the St. Louis, Iron Mountain & Southern for its terminal and yard at Monroe, La. The yard, which will be located south of the cotton mills, east of the main line, will be about a mile long.

MORGANTOWN & DUNKARD VALLEY.—An officer writes that the prospects for building this proposed line are good, and that contracts for the work are to be let during the summer. The proposed route is from Morgantown, W. Va., to Mannington via Cassville, Blacksville, Wadestown and Wise. There are to be 12 or more bridges. W. W. Smith is Secretary and Attorney, Morgantown, W. Va. (See Construction Record.)

NATIONAL OF MEXICO.—Surveys are being made by this company for a line from San Felipe on the main line to Guadalajara; also for a line from Salamanca on the Jaral branch to Guadalajara. An option has also been obtained in that city on lands for terminal yards and shops.

NORTHERN PACIFIC.—Work is proceeding rapidly on the extension of the Port Townsend Southern toward Tacoma.

PORT TOWNSEND SOUTHERN.—See Northern Pacific.

SAN SABA VALLEY.—Charter filed in Texas with $200,000 capital and office at San Saba to build from Antelope Gap, Texas, on the Gulf, Colorado & Santa Fe in Mills County, west through Mills, Lampasas, San Saba and McCulloch counties, by way of San Saba to Crothers, on the Fort Worth & Rio Grande, 50 miles. The directors are E. Campbell, John Kelly, T. A. Murray, R. G. Coryell, W. S. Sanderson, J. H. Martin, J. D. Estep, R. M. Ward and E. L. Rector, all of San Saba.

SOUTHERN PACIFIC.—According to western reports work is to be started at once on a new line from Drain on the Mount Shasta route in Oregon southwest to Marshfield on Coos Bay, about 80 miles. The proposed line is to form the northern portion of a new coast line between San Francisco and Portland.

A contract is reported let by this company to Hemingway & Bowles, of Memphis, Tenn., for grading a new railroad to leave the main line at New Iberia, La. The work will cost about $150,000.

Work has been steadily pushed by the contractors on the Bay Shore cut-off, which is to be finished about the end of this year. This cut-off is to be double track, extending from the Fourth and Townsend street yards of the Southern Pacific in San Francisco

through the Potrero district near the shores of the bay to a point on the main line of the coast division near San Bruno. It will be 11 miles long, and will cost about $3,300,000. It is being built to take the place of the single-track line through the Mission district, which has heavy grades. When finished there will be a double-track road between San Jose and San Francisco, with easy grades. The five tunnels on this new line are of the following lengths: 1,700 ft., 1,200 ft., 2,600 ft., 1,100 ft. and 3,500 ft. They are 22 ft. high and 25 ft. wide. They are lined with concrete and brick. Several of the tunnels were almost completed at the time of the earthquake. The longest one had been bored 1,300 ft. at each end while several of the others were bored 500 ft. at each end. None of them sustained any damage, a fact which the Southern Pacific engineers say was due to the character of the concrete work; to the use of cement with brick thoroughly soaked in water before being laid in the cement.

VANDALIA.—A contract is reported let by this company to double-track its line from Terre Haute, Ind., to Harmony, at a cost of about $2,000,000.

WADSWORTH & WESTERN TRACTION.—This company has increased its capital from $1,000 to $500,000. The company is owned by the Northern Ohio Traction and is planning to build across Ohio from Cleveland southwest to Cincinnati. A branch is also to be built through Medina, Wayne, Ashland and Richland Counties.

WICHITA VALLEY.—See Colorado & Southern.

RAILROAD CORPORATION NEWS.

BOSTON & NEW YORK AIR LINE.—A meeting of the stockholders has been called for June 18 to act on a proposition to sell the property to the New York, New Haven & Hartford, which leases it for 99 years from 1882. The Air Line owns 52 miles of road from New Haven, Conn., northeast to Willimantic, and has outstanding $909,468 common stock, $2,998,500 preferred stock, and $500,000 first mortgage 5 per cent. bonds of 1905.

CALUMET ELECTRIC STREET RAILWAY.—Under order of the Court, the $483,500 capital stock and the $2,926,000 of 5 per cent. consolidated mortgage bonds of 1909 are to be sold to a Chicago syndicate. These securities are the holdings of the National Bank of Illinois which recently went out of existence, and constitute nearly the whole of the stocks and bonds outstanding. The company operates 77 miles of track in and around Chicago.

CHICAGO, MILWAUKEE & ST. PAUL.—This company has bought the Montana Railroad, which is 157 miles long, from Lombard, Mont., to Lewistown. (May 4, p. 138.)

CHICAGO UNION TRACTION.—It is announced that a new company will be formed to take over the holdings of the Chicago Union Traction in the securities of the Chicago Consolidated Traction Co., the North Chicago Street Railroad, and the West Chicago Street Railroad. The two last named companies are leased to the Chicago Union Traction. It is intended to unite the North and West systems into one operating company.

CINCINNATI, BLUFFTON & CHICAGO.—The Receiver has been discharged and the property turned over to the company. The road was projected to run from Huntington, Ind., to Union City, 70 miles, of which 29 miles is completed. There are outstanding $1,125,000 capital stock and $1,500,000 first mortgage 5 per cent. bonds of 1933. The property was put into the hands of a receiver in 1904.

COLUMBUS, BUCK-EYE LAKE & NEWARK TRACTION.—See Indiana, Columbus & Eastern Traction.

DENVER, NORTHWESTERN & PACIFIC.—The Northwestern Terminal Co., a subsidiary of the D., N. & P., incorporated in July, 1904, with $2,500,000 capital stock, has been granted a franchise to build a terminal road and facilities in Denver, Colo. The D., N. & P. now uses the tracks of another road in getting into the city. The new terminal may be used by other roads which now go to the Union Terminal, controlled by the Union Pacific.

DES MOINES & FORT DODGE.—The shareholders of this company, which is controlled by the Minneapolis & St. Louis, which leases it for 30 years from 1905, will meet on June 7 to vote on an issue of not more than $1,000,000 5 per cent. second mortgage bonds. The first mortgage 4 per cent. bonds of 1935, of which there are $3,072,000 outstanding, were issued in 1905 to retire the bonds of the older companies of which the Des Moines & Fort Dodge is a consolidation. The M. & St. L. holds $305,200 six per cent. certificates of indebtedness of the D., M. & F. D., and it is presumed that these will be exchanged for a part of the new bonds.

HOCKING VALLEY.—The committee representing the minority stockholders of the Kanawha & Michigan have reached an agreement with the Hocking Valley by which the K. & M. minority stock is to be exchanged for 60 per cent. of its par value in Hocking Valley common stock. There have been deposited with the committee $3,300,000 of the total $9,000,000 K. & M. capital stock, and it is expected that nearly all of this amount will be exchanged on that basis. The price of Kanawha & Michigan stock has risen during the negotiations from 38 to 73. Hocking Valley common is now quoted at about 128. Assurances have been given that if, as is nearly certain, the $15,000,000 preferred stock of the Hocking Valley is retired, the dividend rate on Hocking Valley common will be raised from 3 per cent. to 6 per cent. During the work of the committee, the fact has been made public that the majority of the Kanawha & Michigan stock is no longer held by the Toledo & Ohio Central, which is controlled by the Hocking Valley, but was acquired some time ago and is now held by the Hocking Valley directly. (May 4, 1906.)

INDIANA, COLUMBUS & EASTERN TRACTION.—This company, which is a holding company for the Widener-Elkins Lines in Central Ohio, has taken over the Columbus, Buck-Eye Lake & Newark. The last named road operates a line from Columbus, Ohio, to Newark, with a branch to Buck-Eye Lake, 39 miles in all. It has outstanding $1,000,000 common stock, $500,000 6 per cent. first mortgage 5 per cent. bonds of 1921.

INTERBOROUGH RAPID TRANSIT.—This company has paid to the Controller of New York City $431,429, being the first annual sinking fund payment of 1 per cent. of its indebtedness to the city. (May 4, p. 138.)

KANAWHA & MICHIGAN.—See Hocking Valley.

MEXICAN CONSOLIDATED ELECTRIC.—This is a new company backed by Canadian capital and organized to acquire all the street railways in and around the city of Mexico. It has acquired the controlling interest in the Mexico Electric Tramways, which operates 160 miles of road, of which 90 miles are worked by electricity, 13 miles by steam, and 57 miles by other power. The new company has applied for authority to change its name to the Mexico Tramway Co., and to obtain further rights.

MINNEAPOLIS & ST. LOUIS.—See Des Moines & Fort Dodge.

MONTANA.—See Chicago, Milwaukee & St. Paul.

NEW BEDFORD & ONSET (ELECTRIC).—This company, which has $500,000 capital stock outstanding and operates 16 miles of road between Fairhaven, Mass., and Onset, has bought the Taunton & Buzzard's Bay, which has 29 miles of track in Middleboro and from there to Buzzard's Bay and Monument Beach, but which has recently suspended operation. The N. B. & O. will assume the $150,000 bonds of the T. & B. B., and will issue $50,000 additional stock to pay for the road.

NEW YORK, NEW HAVEN & HARTFORD.—See Boston & New York Air Line.

NEW YORK, PHILADELPHIA & NORFOLK.—A meeting of the stockholders has been called for June 14 to vote on a plan to issue $500,000 capital stock. This additional stock is to be distributed as a 25 per cent. stock dividend among the stockholders of the $2,000,000 outstanding stock, the total amount authorized being $2,500,000. The company has been paying 8 per cent. annual dividends since 1903.

NORTHWESTERN TERMINAL.—See Denver, Northwestern & Pacific.

READING COMPANY.—The gross and net earnings for the month of April of both the Philadelphia & Reading Railway and the Philadelphia & Reading Coal & Iron Co., show a great decrease as compared with the corresponding period in 1905, reflecting the effect of the recent strike. The gross earnings of the railroad company were $2,461,844, a decrease of $858,613; net earnings $495,506, a decrease of $880,233. The gross earnings of the Coal & Iron Company were $1,074,565, a decrease of $3,535,970. This leaves a deficit of $287,293 as compared with net earnings last year of $262,905.

SOUTHERN MICHIGAN (ELECTRIC).—This company, which is a consolidation of the South Bend & Southern Michigan and the Niles & Buchanan, and which operates a road between South Bend, Ind., and St. Joseph, Mich., 35 miles, has filed a mortgage securing $2,000,000 5 per cent. bonds of 1931. Of these bonds $500,000 is outstanding, $750,000 is reserved to refund the bonds of the South Bend & Southern Michigan, and the remainder is reserved for betterments, improvements and extensions.

TAUNTON & BUZZARD'S BAY (ELECTRIC).—See New Bedford & Onset.

VELASCO, BRAZOS & NORTHERN.—The property of this company has been ordered to be sold under foreclosure, date to be announced later. The company went into the hands of a receiver last February. It operates 20 miles of road from Anchor, Tex., to Velasco. The authorized capital stock is $200,000, and of bonds the same.